Program
BS in Civil Engineering
BS in Computer Engineering
BS in Electrical/Electronic Engineering
BS in Mechanical Engineering
BS in Mechatronic Engineering
Minor in Computer Engineering
MS in Electrical and Computer Engineering
Option in Electronic Engineering
Option in Computer Engineering

Engineering offers programs of study leading to the bachelor’s degree in civil, computer, electrical/electronic, mechanical, and mechatronic engineering. The programs are accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: (410) 347-7700, which accredits U.S. engineering programs. The Engineering curricula are based on a thorough foundation in communication skills, humanities, mathematics, and natural and engineering sciences. The Minor in Computer Engineering does not require an extensive mathematics background and is open to majors ranging from communications to the sciences to liberal arts. It gives students the opportunity to apply computing hardware and software technology in their own discipline.

High School Preparation
For an Engineering Degree
In addition to the mathematics, English, and science courses required for admission to the University, high school students should consider taking introductory courses in computing and pre-calculus. If these high school courses are not completed, additional time may be required to complete an engineering degree.

FE (EIT) Examination
Senior engineering students are encouraged to take the Fundamentals of Engineering (Engineer-In-Training) exam which is the first of two exams required to become a licensed professional engineer by the California State Board of Registration.

Student Organizations
Several professional societies have student chapters on campus that help students by offering tutoring and peer advising. Student organizations conduct meetings with professional engineers, sponsor social events, and organize teams to compete at regional competitions with other universities. The American Society of Civil Engineers, the Structural Engineers Association of California, the Institute of Transportation Engineers, the Society of Plastics Engineers, the Association for Computing Engineers, the Institute of Electrical and Electronics Engineers, the American Society of Mechanical Engineers, the Society of Manufacturing Engineers, the National Society of Black Engineers, and the Society of Women Engineers have active chapters. The national honor societies Tau Beta Pi and Eta Kappa Nu are also available to qualified students. As no national society exists for mechatronics engineers, Chico has formed a local club, the American Institute of Mechatronics Engineers.

MESA Engineering Programs (MEP)
The Mathematics • Engineering • Science Achievement (MESA) Engineering Programs, known collectively as MEP, are a comprehensive recruitment, retention, and graduation effort which assists underrepresented and disadvantaged students pursuing degrees in engineering and computer science. The program offers tutoring, advising, and counseling, and includes a study center and an MEP Theme House on campus. Please visit or call us.

Career Outlook
Opportunities for civil engineers will expand due to the need to maintain and enhance the nation’s infrastructure of transportation, water resources, structural, and environmental systems. Computer engineers are some of the most recruited graduates on the campus. Recent surveys indicate that the demand for engineers with hardware and software design experience will continue to increase in both private and government sectors. Electrical/electronics engineers are in demand by industry and government. This demand is predicted to continue as electronic equipment and embedded systems become more vital to business, industry, and the home.

Mechanical Engineers are employed in a wide range of industries that include aerospace, automotive, manufacturing, power generation, HVAC (heating, ventilation, and air conditioning), electronics/computer, biomedical, food processing, pollution control, and many others. Advanced degrees offer job opportunities at universities and government laboratories.

Mechatronic engineers are expected to be in high demand as the number of “intelligent” products on the market increases. The need for graduates who can design products with “embedded” intelligence and control is growing rapidly as microprocessors are integral to many new consumer products.

Highlighted text indicates a change from the original publication.
High School Preparation for an Engineering Degree

High school graduates planning to study Engineering should complete three years of high school mathematics, including geometry, algebra, and trigonometry. In addition, courses in biology, English, computers, physics, chemistry, and mechanical drawing should be taken to assist the student in transitioning into an Engineering program. If these high school courses are not completed, additional time may be required to complete the requirements for an Engineering degree.

Civil Engineering

Civil engineering graduates qualify for graduate school or professional work in a broad spectrum of engineering activities. The program is well balanced, stressing environmental engineering; engineering mechanics; soil mechanics and foundations; structural analysis and design; surveying and mapping; transportation and traffic engineering; water resources and hydraulics; and construction engineering and management, city planning, and administration.

Civil Engineering Program Mission

The civil engineering program has two comprehensive objectives: to prepare graduates for immediate entry into a variety of professional careers and to provide a solid undergraduate foundation in general principles enabling continued education at advanced levels.

Civil Engineering Educational Objectives

The CSU, Chico Civil Engineering program educational objectives are best framed in terms of the following goals for its graduates:

- Civil Engineering graduates will be prepared to be effective engineers and problem solvers.
- They will be well educated in engineering sciences and proficient in at least four recognized civil engineering areas.
- They will be able to effectively use engineering technology that will enhance their productivity.
- They will be familiar with applicable regulatory and professional issues.
- They will be effective written, technical, and oral communicators, and be able to function effectively as members of multi-disciplinary teams.
- They will have an appreciation for the individual, society, good citizenship, community service, ethical conduct, and human heritage, and they will be aware of the impact of their designs on humankind and the environment.

Civil Engineering Design Experience

The civil engineering program provides an essential balance of engineering science and design. Design content permeates the curriculum, beginning at a fundamental level in the lower division followed by a natural progression to comprehensive design in upper-division courses. Fundamental design problems typically have a unique solution and may involve only a few, simple constraints. Comprehensive design incorporates a multitude of realistic constraints with a variety of possible outcomes—commonly referred to as “open-ended” design.

Required courses in the program provide proficiency in civil engineering design, beginning in the first year (CIVL 131 Introduction to Civil Engineering Design) and culminating with comprehensive design in the third and fourth years (CIVL 431 Environmental Engineering, CIVL 415 Reinforced Concrete Design, and CIVL 441 Transportation Engineering). This ensures a breadth of design experience that is then enhanced and focused in elective courses.

The Bachelor of Science in Civil Engineering

Total Course Requirements for the Bachelor’s Degree: 132 units

See “Requirements for the Bachelor’s Degree” in the University Catalog for complete details on general degree requirements. A minimum of 40 units, including those required for the major, must be upper division.

A suggested Major Academic Plan (MAP) has been prepared to help students meet all graduation requirements within four years. Please request a plan from your major advisor or view it and other current advising information on the CSU, Chico Web.

General Education Requirements: 48 units

Civil engineering major requirements have modifications to the University’s General Education Requirements. The following courses, together with the approved General Education courses required for the civil engineering major, fulfill the General Education Requirement.

1. Select one course from each of the following Breadth areas: A1, A2, C (either C1 or C2 or C3), and D (either D1, or D2, or D3).
2. Upper-division theme modification has been approved for this major. See “General Education” in the University Catalog for specifics on how to apply this modification.

Accreditation Requirement

Courses must be selected in such a manner as to satisfy the humanities, social science, mathematics, base science, and engineering topics requirements of the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: (410) 347-7700. Consult your academic advisor for additional information.

Cultural Diversity Course Requirements: 6 units

See “Cultural Diversity” in the University Catalog. Most courses taken to satisfy these requirements may also apply to General Education.

American Institutions Requirement: 6 units

See the “American Institutions Requirement” under “Bachelor’s Degree Requirements.” For this major, this requirement is normally fulfilled by completing HIST 130 and POLS 155. For this major, HIST 130 may also be applied to General Education Breadth Area C1, C2, or C3, and POLS 155 may also be applied to General Education Breadth Area D1, D2, or D3.

Literacy Requirement

See “Mathematics and Writing Requirements” in the University Catalog. Writing proficiency in the major is a graduation requirement and may be demonstrated through satisfactory completion of a course in your major which has been designated as the Writing Proficiency (WP) course for the semester in which you take the course. Students who earn below a C– are required to repeat the course and earn a C– or better to receive WP credit. See the Class Schedule for the designated WP courses for each semester. You must pass ENGL 130 (or its equivalent) with a C– or better before you may register for a WP course.

Course Requirements for the Major: 107–109 units

The following courses, or their approved transfer equivalents, are required of all candidates for this degree.

Lower-Division Requirements: 53–55 units

14 courses required:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>CIVL 110</td>
<td>Graphics for Civil Engineers</td>
<td>2.0 FS</td>
</tr>
<tr>
<td>Prerequisites: High school trigonometry and algebra.</td>
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</tr>
<tr>
<td>CIVL 130</td>
<td>Surveying</td>
<td>3.0 FA</td>
</tr>
<tr>
<td>Prerequisites: MATH 120 may be taken concurrently.</td>
<td></td>
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</tr>
<tr>
<td>CIVL 131</td>
<td>Intro to Civil Engr Design</td>
<td>3.0 SP</td>
</tr>
<tr>
<td>Prerequisites: CIVL 130</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIVL 205</td>
<td>Computer Applications in Engr</td>
<td>2.0 FS</td>
</tr>
<tr>
<td>Prerequisites: PHYS 204A (may be taken concurrently.</td>
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<tr>
<td>CIVL 211</td>
<td>Statics</td>
<td>3.0 FS</td>
</tr>
<tr>
<td>Prerequisites: MATH 121 and PHYS 204A. CIVL 110 (may be taken concurrently) or MECH 100 and MECH 100L (may be taken concurrently).</td>
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<td></td>
</tr>
<tr>
<td>CHEM 111</td>
<td>General Chemistry</td>
<td>4.0 FS *</td>
</tr>
<tr>
<td>Prerequisites: Second-year high school algebra; one year high school chemistry. (One year of high school physics and one year of high school mathematics past Algebra II are recommended.)</td>
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<tr>
<td>EECE 211L</td>
<td>Linear Circuits I</td>
<td>3.0 FS</td>
</tr>
<tr>
<td>Prerequisites: CIVL 121, PHYS 204B.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EECE 211L</td>
<td>Linear Circuits I Activity</td>
<td>1.0 FS</td>
</tr>
<tr>
<td>Corequisites: EECE 211</td>
<td></td>
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</tr>
<tr>
<td>MATH 120</td>
<td>Analytic Geometry and Calculus</td>
<td>4.0 FS *</td>
</tr>
<tr>
<td>Prerequisites: Completion of ELM requirement; both MATH 118 and MATH 119 (or high school equivalent); a score that meets department guidelines on a department administered calculus readiness exam.</td>
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<tr>
<td>Prerequisites must be completed with a C– or higher.</td>
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</tr>
<tr>
<td>MATH 121</td>
<td>Analytic Geometry and Calculus</td>
<td>4.0 FS</td>
</tr>
<tr>
<td>Prerequisites: MATH 120.</td>
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<td></td>
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<tr>
<td>Prerequisites must be completed with a C– or higher.</td>
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</tr>
<tr>
<td>MATH 260</td>
<td>Elem Differential Equations</td>
<td>4.0 FS</td>
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<tr>
<td>Prerequisites: MATH 121.</td>
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<tr>
<td>Prerequisites must be completed with a C– or higher.</td>
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<tr>
<td>MECH 210</td>
<td>Materials Science/Engineering</td>
<td>3.0 FS</td>
</tr>
<tr>
<td>Prerequisites: PHYS 204A; CHEM 111.</td>
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<tr>
<td>PHYS 204A</td>
<td>Mechanics</td>
<td>4.0 FS *</td>
</tr>
<tr>
<td>Prerequisites: High school physics or faculty permission. Concurrent enrollment in or prior completion of MATH 121 (second semester of calculus) or equivalent.</td>
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<tr>
<td>PHYS 204B</td>
<td>Electricity and Magnetism</td>
<td>4.0 FS</td>
</tr>
<tr>
<td>Prerequisites: MATH 121, PHYS 204A with a grade of C– or higher.</td>
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</tbody>
</table>

1 course selected from:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 220</td>
<td>Analytic Geometry and Calculus</td>
<td>4.0 FS</td>
</tr>
<tr>
<td>Prerequisites: MATH 121.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prerequisites must be completed with a C– or higher.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 335</td>
<td>Elementary Linear Algebra</td>
<td>3.0 FS</td>
</tr>
<tr>
<td>Prerequisites: MATH 121.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prerequisites must be completed with a C– or higher.</td>
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</tbody>
</table>
CIVL 321 (or their transfer equivalents) must repeat the course with a grade of C– or higher.

1 course selected from:
BIOL 100 Concepts of Biology
Prerequisites: High school biology and chemistry.

CIVL 302 Engineering Econ & Statistics
Prerequisites: MATH 121, junior standing.

CIVL 311 Strength of Materials
Prerequisites: CIVL 211 with a grade of C– or higher; CIVL 110 or MECH 100 and MECH 100L; MATH 260 and MECH 210 (may be taken concurrently).

CIVL 312 Structural Testing Laboratory
Prerequisites: CIVL 205; CIVL 311 with a grade of C– or higher.

CIVL 313 Structural Mechanics
Prerequisites: CIVL 205 (may be taken concurrently); CIVL 311 with a grade of C– or higher.

CIVL 321 Fluid Mechanics
Prerequisites: CIVL 211 with a grade of C– or higher. Recommended: MATH 260, MECH 320 (may be taken concurrently).

CIVL 402 Contracts/Specs/Tech Reports
Prerequisites: ENGL 130 (or its equivalent) with a grade of C– or higher, junior standing.

CIVL 411 Soil Mechanics and Foundations
Prerequisites: CIVL 312 and CIVL 321 (may be taken concurrently); ENGL 130 or equivalent.

CIVL 415 Reinforced Concrete Design
Prerequisites: CIVL 312, CIVL 313. Recommended: CIVL 411.

CIVL 431 Environmental Engineering
Prerequisites: CHEM 111, CIVL 321 with a grade of C– or higher, or faculty permission; BIOL 101 or BIOL 108.

CIVL 441 Transportation Engineering
Prerequisites: CIVL 131; CIVL 302 (may be taken concurrently); CIVL 312, CIVL 411.

CIVL 495 Lifelong Development Engineers
Prerequisites: ENGL 130 (or its equivalent); senior standing.

MECH 320 Dynamics
Prerequisites: CIVL 211 with a grade of C– or higher, MATH 260.

MECH 332 Thermodynamics
Prerequisites: PHYS 204A. Recommended: PHYS 204C.

CIVL 302 and CIVL 495 are approved General Education courses for the Civil Engineering major.

6 units selected from:
Any 500-level CIVL, 400/500-level MECH, or 400-level ECE courses, or MECH 308 or MECH 338.

3 units selected from:
Other technical courses to be chosen from a list approved by the department.

Patterns of Specialization:
Construction, Environmental, Structural, Transportation, and Water Resource Engineering patterns are available to civil engineering students who choose to select the four major electives from a restricted group of courses which emphasize study in the selected pattern. Graduates who satisfy an elective pattern will receive Civil Engineering Department recognition for the specialty area of their degree. Additional information is available from the CE office or faculty advisor.

Grading Requirement:
All courses taken to fulfill major course requirements must be taken for a letter grade except those courses specified by the department as Credit/No Credit grading only.
All students must attain a minimum 2.0 Grade Point Average (GPA) in all college courses attempted and for all courses attempted at Chico. Civil Engineering majors must also attain a minimum 2.0 GPA in:
(a) All courses required for the major, and
(b) All Civil Engineering (CIVL) courses taken at CSU, Chico to meet major requirements.
A student receiving a grade of D+ or lower in CIVL 211, CIVL 311, or CIVL 321 (or their transfer equivalents) must repeat the course with a grade of C– or higher prior to enrolling in any other CIVL course for which the subject course is prerequisite. The student may petition the Department of Civil Engineering to review the application of this policy in his/her situation if serious and compelling conditions contributed to the poor grade.

Advising Requirement:
Advising is mandatory for all majors in this degree program. Consult your undergraduate advisor for specific information.
A sample program for students who wish to complete their major in four years is available upon written request to the department, CSU, Chico, CA 95929-0930.

Honors in the Major
Honors in the Major is a program of independent work in your major. It involves 6 units of honors course work over two semesters.
Your Honors work will be recognized at your graduation, on your permanent transcripts, and on your diploma. It is often accompanied by letters of commendation from your mentor in the department or the department chair. Most importantly, however, the Honors in the Major program allows you to work closely with a faculty mentor in your area of interest on an original performance or research project. This year-long collaboration allows you to work in your field at a professional level and culminates in a public presentation of your work. Students sometimes take their projects beyond the University for submission in professional journals, presentation at conferences, or competition in shows; such experience is valuable for graduate school and later professional life.

Some common features of Honors in the Major are:
1. You must take 6 units of Honors in the Major course work. You must complete the 6 units with a minimum grade of B.
2. You must have completed 9 units of upper-division course work or 21 units overall in your major before you can be admitted to Honors in the Major. Check the requirements carefully, as there may be specific courses that must be included in these units.
3. Your cumulative GPA should be at least 3.5 or within the top 5% of majors in your department.
4. Your GPA in your major should be at least 3.5 or within the top 5% of majors in your department.
5. Most students apply for or are invited to participate in Honors in the Major during the second semester of their junior year. Then they complete the 6 units of course work over the two semesters of their senior year.
6. Your honors work culminates with a public presentation of your honors project.
While Honors in the Major is part of the Honors Program, each department administers its own program. Please contact your department chair to apply.

Honors in Civil Engineering
The common elements of the Honors in the Major program listed above apply to Honors in Civil Engineering. Specific information for this program includes:
1. In addition to meeting the GPA requirements, you must be recommended by a faculty member.
2. Students who are admitted into the department’s Honors in the Major program may elect to take any two upper-division civil engineering electives for honors credit. The honors section will be identified on your transcript. The courses are usually spread over two semesters. You must complete them with a minimum grade of B and maintain a minimum GPA of 3.0 overall.
3. Each Honors in the Major class will require completion of the course plus an additional honors project and culminates with a public presentation of your honors project.

The Faculty
Civil Engineering
Joel F. Arthur, 1986, Chair, Professor, PE, PhD, UC Davis.
DingXin Cheng, 2006, Assist Professor, PE, PhD, Texas A&M U.
Kenneth Derucher, 1994, Dean, Professor, PhD, Virginia Tech.
Tonya L. Emerson, 2001, Assoc Professor, PE, PhD, UC Davis.
Curtis B. Haselton, 2000, Assoc Professor, PE, PhD, Stanford U.
Steffen W. Mehl, 2007, Assoc Professor, PhD, U Colorado.
Russell S. Mills, 1982, Professor, PE, PhD, Stanford U.
Stewart M. Oakley, 1984, Professor, PhD, Oregon State U.
James S. Scolaro, 2000, Research Assist Professor, BS, CSU Chico.
Emeritus Faculty
Thomas C. Ferrara, 1971, Professor Emeritus, PE, PhD, UC Davis.
A. Reed Gibby, 1984, Professor Emeritus, PE, PhD, UC Davis.
Kenneth V. Henkel, 1979, Professor Emeritus, PE, PhD, U Wisconsin.
Elliot B. Johnson, 1956, Professor Emeritus, MS, Iowa State U.

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Maurice Mow, 1978, Professor Emeritus, PE, PhD, Rensselaer Poly Inst.
Charles C. Mueller, 1973, Professor Emeritus, PE, PhD, Michigan State U.
John D. Teasdale, 1966, Professor Emeritus, PE, MS, U Iowa.
Gary Z. Watters, 1980, Professor Emeritus, PE, PhD, Stanford U.

PE designates Registered Professional Engineer

Civil Engineering Course Offerings

Please see the section on “Course Description Symbols and Terms” in the University Catalog for an explanation of course description terminology and symbols, the course numbering system, and course credit units. All courses are lecture and discussion and employ letter grading unless otherwise stated. Some prerequisites may be waived with faculty permission. Many syllabi are available on the Chico Web.

CIVL 110 Graphics for Civil Engineers
Prerequisites: High school trigonometry and algebra.
This course is an introduction to civil engineering graphical communication using both free-hand sketching and computer-aided drafting, including graphical solutions to three-dimensional geometry problems (descriptive geometry) as well as engineering data management. 4.0 hours activity. Special fee required; see the Class Schedule.

CIVL 120 Surveying for Non-Engineers
Prerequisites: One semester of high school trigonometry or MATH 118.
Theory and practice in measurement and computation of distances, angles, and areas on the earth’s surface. Error of combined measurements analysis. Use of scientific calculator required. 2.0 hours discussion, 3.0 hours laboratory.

CIVL 130 Surveying
Prerequisites: MATH 120 (may be taken concurrently).
Theory and practice in measurement and computation of distances, angles, and areas on the earth’s surface. Error of combined measurements analysis. Use of scientific calculator required. 2.0 hours discussion, 3.0 hours laboratory. Special fee required; see the Class Schedule.

CIVL 130X Surveying Problem Session
Prerequisites: Coreq. CIVL 130.
Supplemental applications and explanations intended to facilitate student understanding of content from CIVL 130. 2.0 hours activity. Credit/no credit grading only.

CIVL 131 Introduction to Civil Engineering Design
Prerequisites: CIVL 130.
Provides an introduction to civil engineering facilities and systems (environmental, structural, transportation and water resources), environmental impacts of those systems, historical development of design, introduction to design concepts and procedures, examples of the design of civil engineering systems, creativity in design, and applications in civil engineering design—horizontal curves, vertical curves, earthwork, state plane coordinates, geographic information systems and global positioning systems. 2.0 hours discussion, 3.0 hours laboratory. Special fee required; see the Class Schedule.

CIVL 131X Civil Engineering Design Problem Session
Prerequisites: Concurrent enrollment in CIVL 131.
Supplemental applications and explanations intended to facilitate student understanding of content from CIVL 131. 2.0 hours activity. Credit/no credit grading only.

CIVL 205 Computer Applications in Engineering
Prerequisites: PHYS 204A (may be taken concurrently).
Use of the computer in a variety of applications from the fields of engineering. Topics include computer hardware, operating systems, the Internet, technical word processing, electronic spreadsheets, computer charting and drawing, computer programming, and ethics. 4.0 hours activity.

CIVL 211 Statics
Prerequisites: MATH 121 and PHYS 204A. CIVL 110 (may be taken concurrently) or MECH 100 and MECH 100L (may be taken concurrently).
Force systems, moments, equilibrium, centroids, and moments of inertia. 2.0 hours discussion. CAN ENGR B.

CIVL 211X Statics Problem Session
Prerequisites: Concurrent enrollment in CIVL 211.
Supplemental applications and explanations intended to facilitate student understanding of content from CIVL 211. 2.0 hours activity. Credit/no credit grading only.

CIVL 302 Engineering Economy and Statistics
Prerequisites: MATH 121, junior standing.
Analysis of alternatives by basic engineering economic methods and applications of statistics including probability, sampling theory and data analysis, and tests of hypotheses. 3.0 Fa/Spr

CIVL 302X Engineering Economy and Statistics Problem Session
Corequisites: CIVL 302.
Supplemental applications and explanations intended to facilitate student understanding of content from CIVL 302. 2.0 hours activity. Credit/no credit grading only.

CIVL 311 Strength of Materials
Prerequisites: CIVL 211 with a grade of C– or higher; CIVL 110 or MECH 100 and MECH 100L; MATH 260 and MECH 210 (may be taken concurrently).
Strength and elastic properties of materials of construction: tension, compression, shear, and torsion stresses; deflection and deformation; stress analysis of beams and columns.

CIVL 311X Strength of Materials Problem Session
Prerequisites: Concurrent enrollment in CIVL 311.
Supplemental applications and explanations intended to facilitate student understanding of content from CIVL 311. 2.0 hours activity. Credit/no credit grading only.

CIVL 321 Fluid Mechanics
Prerequisites: CIVL 211 with a grade of C– or higher. Recommended: MATH 260, MECH 320 (may be taken concurrently).
Hydrostatics, principles of continuity, work-energy and momentum, viscous effects, dimensional analysis and similarity, flow in closed conduits, drag on objects. 3.0 hours discussion, 3.0 hours laboratory.

CIVL 321X Fluid Mechanics Problem Session
Prerequisites: Concurrent enrollment in CIVL 321.
Supplemental applications and explanations intended to facilitate student understanding of content from CIVL 321. 2.0 hours activity. Credit/no credit grading only.

CIVL 342 Planning of Public Works Projects
Prerequisites: Junior standing.
Not intended for engineering majors. A non-mathematical approach to the decisions made in the planning of public works projects, with particular emphasis on the management of resources and policy. 3.0 hours laboratory.

CIVL 350 Ethics, Technology, and Society
Prerequisites: PHIL 312 and General Education Areas B1 and D3.
A scholarly treatment of the technological impacts on developed and less developed societies in an ethical context. Assessment techniques will be introduced and applied. Historical, current, emerging, and future technologies (communication, transportation, agriculture, cloning, robotics, etc.) to be assessed. (This course cannot be taken as an engineering elective.)

CIVL 389 Civil Engineering Internship
Prerequisites: Approval of supervising faculty member prior to off-campus assignment.
This course is an internship offered for 1.0–3.0 units. You must register directly with a supervising faculty member. This program is designed for students who wish to gain practical work experience with participating civil engineering firms/organizations. You may take this course more than once for a maximum of 15.0 units. Credit/no credit grading only.

CIVL 398 Special Topics
Prerequisites: Open to all students. Approved by supervising faculty member. This course is offered for 1.0–3.0 units. Prerequisites may vary from term to term and may vary from term to term and may vary from term to term.

CIVL 399 Special Problems
Prerequisites: Faculty permission.
This course is a seminar for special problems offered for 1.0–3.0 units. It is intended for students who wish to take an intensive study of a special topic.

Corequisites: CIVL 302.

CIVL 402 Contracts, Specifications, and Technical Reports 4.0 Fa/Spr
Prerequisites: ENGL 130 (or its equivalent) with a grade of C– or higher, junior standing.
Introduction to law as it relates to the practice of civil engineering. Operation of a successful civil engineering business. Writing various technical reports and specifications. This is a writing proficiency, WP, course; a grade of C– or better certifies writing proficiency for majors.

CIVL 411 Soil Mechanics and Foundations 4.0 Spring
Prerequisites: CIVL 312 and CIVL 321 (may be taken concurrently); ENGL 130 or equivalent.
Soil properties, tests, and classification. Analysis of soil stresses, consolidation, shear strength, lateral pressures, and ground water movement. Related design consideration involving spread footings, piles, retaining walls, and slopes. Use of programmable scientific calculator required. 3.0 hours discussion, 3.0 hours laboratory.

CIVL 415 Reinforced Concrete Design 4.0 Fall
Prerequisites: CIVL 312, CIVL 313. Recommended: CIVL 411.
The analysis and design of reinforced concrete structures and elements by the strength design method. Laboratory includes experiments on concrete, concrete structural elements, and a design project. 3.0 hours discussion, 3.0 hours laboratory.

CIVL 431 Environmental Engineering 4.0 Spring
Prerequisites: CHEM 111, CIVL 321 with a grade of C– or higher, or facility permission; BIOL 101 or BIOL 108.
Introduction to water quality, water supply, distribution, and drinking water treatment; wastewater collection, treatment, and disposal. Disease transmission; water quality parameters; physical, chemical, and biological processes in the treatment of water, wastewater, and biosolids. 3.0 hours discussion, 3.0 hours laboratory.

CIVL 441 Transportation Engineering 4.0 Fall
Prerequisites: CIVL 313; CIVL 302 (may be taken concurrently); CIVL 312, CIVL 411.
Transportation systems and facility planning, design, construction, operations, and maintenance. Pavement design and traffic engineering fundamentals. Laboratory includes field studies, design exercises, and modeling/forecasting tasks. 3.0 hours discussion, 3.0 hours laboratory.

CIVL 489 Civil Engineering Internship 1.0–3.0 Fa/Spr
Prerequisites: Approval of supervising faculty member prior to off-campus assignment. This course is an internship offered for 1.0–3.0 units. You must register directly with a supervising faculty member. This program is designed for students who wish to gain practical work experience with participating civil engineering firms/organizations. You may take this course more than once for a maximum of 15.0 units.

CIVL 495 Lifelong Development for Engineers 3.0 Fa/Spr
Prerequisites: ENGL 130 or equivalent; senior standing.
Professional practices in engineering: ethics, opportunities for continued development, design practices, proper use of computer software, professional relationships. A substantial written project will be required. 2.0 hours discussion, 2.0 hours activity.

CIVL 498 Advanced Topics 1.0–3.0 Fa/Spr
Prerequisites: To be established when courses are formulated. This course is for special topics offered for 1.0–3.0 units. Typically the topic is offered on a one-time-only basis and may vary from term to term and be different for different sections. See the Class Schedule for the specific topic being offered. Credit/no credit grading only.

CIVL 499 Special Problems 1.0–3.0 Fa/Spr
Prerequisites: Faculty permission.
This course is an independent study of special problems offered for 1.0–3.0 units. You must register directly with a supervising faculty member. You may take this course more than once for a maximum of 6.0 units. Credit/no credit grading only.

CIVL 499H Honors Project 3.0 Inquire
Prerequisites: Completion of 12 units of upper-division C E courses, faculty permission.
This course may be taken twice for a maximum of 6 units. Prerequisite to the second semester is a B or higher in the first semester. Open by invitation to C E majors who have a GPA among the top 5% of C E students based upon courses taken at CSU, Chico. This is an “Honors in the Major” course; a grade of B or higher in 6 units of 499HH certifies the designation of “Honors in the Major” to be printed on the transcript and the diploma. Each 3-unit course will require both formal written and oral presentations. You may take this course more than once for a maximum of 6.0 units.

CIVL 550 Advanced Surveying 3.0 Inquire
Prerequisites: CIVL 131 or faculty permission.
Laws, practices, and historical background on land surveying. Includes property surveys and legal descriptions. Use of personal computers required. 2.0 hours discussion, 3.0 hours laboratory.

CIVL 551 Foundations Engineering 3.0 Inquire
Prerequisites: CIVL 411. Recommended: CIVL 415.
The application of soil mechanics principles to the design of foundations for buildings and earth structures. Integration of structural design and soil response.

CIVL 553 Advanced Structural Analysis 3.0 Inquire
Prerequisites: CIVL 313.
Analysis of statically determinate and indeterminate structures under the action of external effects, including gravity and lateral loading. Emphasis on computer analysis of trusses, continuous beams, and rigid frames, using both flexibility and stiffness approaches. Introduction to the finite element method for structural mechanics applications.

CIVL 554 Steel Design 3.0 Inquire
Prerequisites: CIVL 313.
Theory, analysis, and design of steel structural elements and systems using the Load and Resistance Factor Design (LRFD) method.

CIVL 556 Timber Design 3.0 Inquire
Prerequisites: CIVL 313.
Elements of timber design. Analysis and design procedures for timber structures and their connections to resist gravity and lateral loads. Basic design element by the Allowable Stress Design (ASD) and/or Load and Resistance Factor Design (LRFD) methods are detailed. Also covered is design of floor and roof systems and shear walls. One or two 3-hour field trips required.

CIVL 557 Prestressed Concrete and Reinforced Masonry Design 3.0 Inquire
Prerequisites: CIVL 313. Recommended: CIVL 415.
Theory, analysis, design, and construction of prestressed concrete, precast concrete, and masonry structural elements and systems using working stress and/or ultimate strength design methods.

CIVL 558 Earthquake and Wind Engineering 3.0 Inquire
Prerequisites: CIVL 313, MATH 260. Recommended: Concurrent enrollment in or prior completion of CIVL 415, CIVL 554, CIVL 556, or CIVL 557.
Introduction to the problems of developing countries.

CIVL 561 Open Channel Hydraulics 3.0 Inquire
Prerequisites: CIVL 205, CIVL 321 with a grade of C– or higher. Principles and applications of steady, gradually varying, and unsteady open channel hydraulics.

CIVL 562 Engineering Hydrology 3.0 Inquire
Prerequisites: CIVL 321 with a grade of C– or higher or facility permission.
A concise treatment of modern hydrology, emphasizing a quantitative approach to surface-water runoff, ground-water runoff, precipitation, evapotranspiration, climate, infiltration, drainage-basin characteristics.

CIVL 567 Pipeline Hydraulics and Design 3.0 Inquire
Prerequisites: CIVL 302; CIVL 321 with a grade of C– or higher (may be taken concurrently).
Design of pumped pipelines, analysis of transients in pipe systems caused by valve movement, pump power failure, etc. Design of transient controls through operational procedures and devices such as surge relief valves, air chambers, and surge tanks.

CIVL 571 Natural Systems for Wastewater Treatment 3.0 Inquire
Prerequisites: CIVL 431 or facility permission.
Natural systems for the treatment of wastewater; transmission of excreta-related infections; treatment systems for removal of pathogens; wastewater and biosolids reuse in agriculture and aquaculture. Special emphasis on the problems of developing countries.

CIVL 573 Water Quality Engineering 3.0 Inquire
Prerequisites: CIVL 431 or facility permission.
Water quality criteria and standards; engineering design; management and monitoring of water quality.

CIVL 575 Solid and Hazardous Waste Management 3.0 Inquire
Prerequisites: CIVL 431 or facility permission.
An introduction to the handling and management of solid and hazardous wastes. Emphasis on state-of-the-art engineering techniques and contemporary management issues based on social, economic, and legal considerations; risk assessment; case studies. Special emphasis on problems of developing countries.
CIVL 581 Transportation Pavements 3.0 Inquire
Prerequisites: CIVL 441 or faculty permission. Characteristics and manufacture of bituminous materials; engineering properties, design, and production of bituminous mixtures; analysis, design, and construction of flexible and rigid pavement cross-sections; stabilization of sub-grades; analysis of pavement distress; development and operation of pavement management systems; and application of computer software. 2.0 hours discussion, 2.0 hours activity.

CIVL 583 Urban Transportation Systems Planning 3.0 Inquire
Prerequisites: CIVL 441 or faculty permission. Introduction to systems approach, urban transportation technology, urban problems and transportation, forecasting methods, urban transportation models and calibration, traffic impact studies and USDOT planning requirements.

CIVL 585 Traffic Engineering 3.0 Inquire
Prerequisites: CIVL 441 or faculty permission. Traffic engineering fundamentals, traffic control signs, markings, and signals. Intersection and highway capacity, Highway safety and accident investigations. Design of streets and parking facilities. Assessment of the environmental impact of traffic.

CIVL 592 Construction Management 3.0 Inquire
Prerequisites: CIVL 205; CIVL 321 (may be taken concurrently). Recommended: CIVL 302. Introduction to construction engineering and management. Cost estimation for contract construction and engineering, including labor, material, equipment, and overhead costs. Construction procedures, equipment and methods, efficient use of excavation and hauling equipment operations. Application of on balance, process chart and operations research techniques to construction operations. Planning, scheduling, and progress controls of construction operations. One or two three-hour field trips may be required.

CIVL 598 Advanced Special Topics 1.0–3.0 Fa/Spr
Prerequisites: To be established when courses are formulated. This course is for special topics offered for 1.0–3.0 units. Typically the topic is offered on a one-time-only basis and may vary from term to term and be different for different sections. See the Class Schedule for the specific topic being offered.

CIVL 599 Special Problems 1.0–3.0 Inquire
Prerequisites: Faculty permission. This course is an independent study of special problems offered for 1.0–3.0 units. You must register directly with a supervising faculty member. You may take this course more than once for a maximum of 6.0 units. Credit/no credit grading only.

CIVL 656 Advanced Timber Design Activity 1.0 Inquire
Prerequisites: CIVL 556 or faculty permission. Advanced timber design activities including design projects for lateral loads (seismic or wind) in horizontal diaphragms and shear walls, seismic connections, flexible diaphragm deflections, and development of computational aids for the design of timber systems. 2.0 hours activity.

CIVL 658 Advanced Earthquake and Wind Engineering Activity 1.0 Inquire
Prerequisites: CIVL 558 or faculty permission. Recommended: Completion of or concurrent enrollment in an advanced structural design course or equivalent. Investigations of current topics in earthquake and wind hazard related to the structural design of buildings. 2.0 hours activity.

CIVL 661 Advanced Open Channel Hydraulics Design Activity 1.0 Inquire
Prerequisites: CIVL 561 or faculty permission. Procedures for the design of open channels. Applications in steady, gradually-varying, and unsteady open channel hydraulics. 2.0 hours activity.

CIVL 681 Advanced Transportation Pavements Discussion 1.0 Inquire
Prerequisites: CIVL 441 and CIVL 581 or faculty permission. A comparative and critical analysis of the various pavement design techniques and the application and evaluation of pavement design software. 2.0 hours activity.

CIVL 697 Independent Study 1.0–3.0 Fa/Spr
Prerequisites: Faculty permission. This course is a graduate-level independent study offered for 1.0–3.0 units. You must register directly with a supervising faculty member. You may take this course more than once for a maximum of 6.0 units.

CIVL 699T Master's Study 1.0–6.0 Fa/Spr
Prerequisites: Faculty permission. This course is a master's study offered as either a Master's Thesis or as a Master's Project for 1.0–6.0 units. You must register directly with a supervising faculty member.

Engineering Course Offerings
Please see the section on “Course Description Symbols and Terms” in the University Catalog for an explanation of course description terminology and symbols, the course numbering system, and course credit units. All courses are lecture and discussion and employ letter grading unless otherwise stated. Some prerequisites may be waived with faculty permission. Many syllabi are available on the Chico Web.

ENGR 101 MESA Orientation Class 2.0 Fall
Prerequisites: MESA eligibility. A comprehensive introduction that provides incoming Math, Engineering, Science Achievement (MESA) students with an overview of the fields of engineering and computer science, along with information on degree requirements, technical skills needed, working in industry, professional organizations, and professional development. In addition, there is an introduction to campus resources and university life for first-year MESA students. ABC/no credit grading only.

Computer Engineering
The computer engineering program at CSU, Chico bridges the curricular gap between electrical/electronic engineering and computer science. The program is designed to provide a broad background in both the theory and practice of computer hardware and software design and the integration of both into usable computer systems. The curriculum includes courses in logic design, microprocessor system design, computer interfacing, programming and data structures, computer architecture and assembly language programming, embedded system design, and system requirements and design. The program is accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: (410) 347-7700.

Computer Engineering Program Mission
The Electrical and Computer Engineering Department educates each student to be a responsible and productive computer engineer who can effectively respond to future challenges.

Computer Engineering Program Objective
The objective of the Computer Engineering Program is to produce graduates able to:

- Apply knowledge of mathematics, science, and engineering to identify, formulate, and solve computer engineering problems.
- Use industry standard tools to analyze, design, develop, and test computer-based systems containing both hardware and software components.
- Achieve success in graduate programs in computer engineering, electrical engineering, or computer science.
- Continue to develop their knowledge and skills after graduation in order to succeed personally and contribute to employer success.
- Work effectively as a member of a multi-disciplinary development team and undertake leadership roles when appropriate.
- Communicate their thoughts, in both written and oral forms, so that others can comprehend and build on their work.
- Appreciate the importance of ethics in the profession and the need to act in society's best interest.

Computer Engineering Design Experience
Design is a fundamental aspect of the computer engineering curriculum and it is integrated into the curriculum beginning in the freshman year where students are introduced to both hardware and software design. As students expand their knowledge and analysis skills through the sophomore and junior years, the design problems they are assigned increase in complexity. Design problems are assigned in electronics, digital and microprocessor systems, embedded systems, and software systems. The design experience culminates in the senior year when all students are required to identify a design project, create testable requirements for the project, design the project, and construct the project to prove the design works. Projects chosen by students often include elements of both hardware and software design. In the past, the students have designed computers, robots, security systems, sophisticated Web applications, and peripheral interfaces.

Highlighted text indicates a change from the original publication.
The Bachelor of Science in Computer Engineering

Total Course Requirements for the Bachelor’s Degree: 132 units

See “Requirements for the Bachelor’s Degree” in the University Catalog for complete details on general degree requirements. A minimum of 40 units, including those required for the major, must be upper division.

A suggested Major Academic Plan (MAP) has been prepared to help students meet all graduation requirements within four years. Please request a plan from your major advisor or view it and other current advising information on the CSU, Chico Web.

General Education Requirements

Computer Engineering is a major with modifications to the University’s General Education Requirements. The following requirements, together with the approved General Education courses required for the Computer Engineering major (marked with an * below), fulfill the General Education Requirement.

1. Select two courses, one from each of the Core Areas A1 and A2.
2. Select one course from Breadth Area C1 or C2 or C3. A course that also fulfills the Ethnic or Non-Western requirement is recommended.
3. Select one course from Breadth Area D1 or D2 or D3. A course that also fulfills the Ethnic or Non-Western requirement is recommended.
4. Upper-division theme modification has been approved for this major. See “General Education” in the University Catalog for specifics on how to apply this modification.

Cultural Diversity Course Requirements: 6 units

See “Cultural Diversity” in the University Catalog. Most courses used to satisfy these requirements may also apply to General Education Areas C and D.

American Institutions Requirement: 6 units

This requirement is normally fulfilled by completing HIST 130 and POLS 155. For other alternatives, see the “Bachelor’s Degree Requirements” section.

Literacy Requirement:

See “Mathematics and Writing Requirements” in the University Catalog. Writing proficiency in the major is a graduation requirement and may be demonstrated through satisfactory completion of a course in your major which has been designated as the Writing Proficiency (WP) course for the semester in which you take the course. Students who earn below a C– or better to receive WP credit. See the Class Schedule for the designated WP courses for each semester. You must pass ENGL 130 (or its equivalent) with a C– or better before you may register for a WP course.

Course Requirements for the Major: 108 units

The following courses, or their approved transfer equivalents, are required of all candidates for this degree.

Lower-Division Requirements: 51 units

15 courses required:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 111</td>
<td>General Chemistry</td>
<td>4.0 FS *</td>
</tr>
<tr>
<td>Prerequisites: Second-year high school algebra; one year high school chemistry. (One year of high school physics and one year of high school mathematics; Mathematical Analysis II is recommended.)</td>
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</tr>
<tr>
<td>CSCI 112</td>
<td>Programming and Algorithm I</td>
<td>3.0 FS</td>
</tr>
<tr>
<td>Prerequisites: Grade of C or better in CSCI 111 or ECE 135 (or engineering majors).</td>
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</tr>
<tr>
<td>EECE 101</td>
<td>Intro Elec/Comp Engr</td>
<td>2.0 FS</td>
</tr>
<tr>
<td>EECE 135</td>
<td>Algorithms &amp; Progs for Engrs</td>
<td>3.0 FS</td>
</tr>
<tr>
<td>Prerequisites: MATH 108 is recommended.</td>
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<td></td>
</tr>
<tr>
<td>EECE 144</td>
<td>Logic Design Fundamentals</td>
<td>4.0 FS</td>
</tr>
<tr>
<td>Prerequisites: Recommended: EECE 101, MEC 100.</td>
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</tr>
<tr>
<td>EECE 211</td>
<td>Linear Circuits I</td>
<td>3.0 FS</td>
</tr>
<tr>
<td>Prerequisites: MATH 121, PHYS 204A.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EECE 211L</td>
<td>Linear Circuits I Activity</td>
<td>1.0 FS</td>
</tr>
<tr>
<td>Corequisites: EECE 211.</td>
<td></td>
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</tr>
<tr>
<td>EECE 221</td>
<td>Processor Arch/Assembly Lang</td>
<td>3.0 FS</td>
</tr>
<tr>
<td>Prerequisites: Either CSCI 111 or ECE 135.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 120</td>
<td>Analytic Geometry and Calculus</td>
<td>4.0 FS *</td>
</tr>
<tr>
<td>Prerequisites: Completion of ELM requirement; both MATH 118 and MATH 119 (or high school equivalent); a score that meets department guidelines on a department administered calculus readiness exam.</td>
<td></td>
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<tr>
<td>Prerequisites must be completed with a C– or higher.</td>
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</tr>
<tr>
<td>MATH 121</td>
<td>Analytic Geometry and Calculus</td>
<td>4.0 FS</td>
</tr>
<tr>
<td>Prerequisites: MATH 120.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 220</td>
<td>Analytic Geometry and Calculus</td>
<td>4.0 FS</td>
</tr>
<tr>
<td>Prerequisites: MATH 121.</td>
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</tr>
</tbody>
</table>

Upper-Division Requirements: 57 units

15 courses required:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL 495</td>
<td>Lifelong Development Engineers</td>
<td>3.0 FS</td>
</tr>
<tr>
<td>Prerequisites: ENGL 130 or equivalent; senior standing.</td>
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</tr>
<tr>
<td>CSCI 311</td>
<td>Algorithms and Data Structures</td>
<td>3.0 FS</td>
</tr>
<tr>
<td>EEE 311</td>
<td>Linear Circuits II</td>
<td>4.0 FS</td>
</tr>
<tr>
<td>Prerequisites: EEE 211; MATH 260 (may be taken concurrently).</td>
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<td></td>
</tr>
<tr>
<td>EEE 315</td>
<td>Electronics I</td>
<td>4.0 FS</td>
</tr>
<tr>
<td>EECE 320</td>
<td>System Architect/Performance</td>
<td>3.0 FA</td>
</tr>
<tr>
<td>Prerequisites: Either CSCI 120 or MATH 260 (may be taken concurrently).</td>
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</tr>
<tr>
<td>EEE 335</td>
<td>Proj Requirements/Test</td>
<td>3.0 FS</td>
</tr>
<tr>
<td>Prerequisites: ENGL 130; either CSCI 112 or EEE 221.</td>
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</tr>
<tr>
<td>EEE 344</td>
<td>Digital Systems Design</td>
<td>4.0 FS</td>
</tr>
<tr>
<td>Prerequisites: Either EEE 144, EECE 211, or MATH 260.</td>
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</tr>
<tr>
<td>EEE 365</td>
<td>Signals and Transforms</td>
<td>4.0 FS</td>
</tr>
<tr>
<td>Prerequisites: EEE 311, MATH 260.</td>
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</tr>
<tr>
<td>EEE 371</td>
<td>SW Engr-Requirements &amp; Design</td>
<td>3.0 FA</td>
</tr>
<tr>
<td>Prerequisites: CSCI 112.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EEE 347</td>
<td>Real-Time Embedded Systems</td>
<td>4.0 SP</td>
</tr>
<tr>
<td>Prerequisites: CSCI 111; either EEE 221 or EEE 221.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommended: CSCI 112; either CSCI 320 or ECE 320.</td>
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</tr>
<tr>
<td>EEE 444</td>
<td>Microprocessor Systems Design</td>
<td>4.0 SP</td>
</tr>
<tr>
<td>Prerequisites: EEE 344.</td>
<td></td>
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</tr>
<tr>
<td>EEE 490A</td>
<td>Senior Project Design/Document</td>
<td>3.0 FS WP</td>
</tr>
<tr>
<td>Prerequisites: ENGL 130 (or its equivalent) with a grade of C– or higher.</td>
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</tr>
<tr>
<td>EEE 434, EEE 344; either EEE 316 or EEE 444 (may be taken concurrently).</td>
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</tr>
<tr>
<td>EEE 490B</td>
<td>Senior Project Implementation</td>
<td>2.0 FS</td>
</tr>
<tr>
<td>Prerequisites: EEE 490A; either EEE 316 or EEE 444.</td>
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</tr>
</tbody>
</table>

6 units selected from:

Any approved upper-division engineering, science, or math courses not otherwise required for graduation.

Grading Requirement:

All courses taken to fulfill major course requirements must be taken for a letter grade except those courses specified by the department as Credit/No Credit grading only.

All students must attain a 2.0 Grade Point Average (GPA) in all college courses attempted and for all courses attempted at Chico. Computer Engineering majors must also attain a 2.0 GPA in:

(a) All courses required for the major, and
(b) All Electrical and Computer Engineering (ECE) and Computer Science (CSCI) courses taken to meet major requirements at CSU, Chico.

Advising Requirement:

Advising is mandatory for all majors in this degree program. Consult your undergraduate advisor for specific information.

A sample program for students who wish to complete their major in four years is available upon request to the department, CSU, Chico, CA 95929-0888, or on the department’s website.

Honor’s in the Major

Honors in the Major is a program of independent work in your major. It involves six units of honors course work completed over two semesters. The Honors in the Major program allows you to work closely with a faculty mentor in your area of interest on an original performance or research project. This year-long collaboration allows you to work in your field at a professional level and culminates in a public presentation of your work. Students sometimes take their projects beyond the University for submission in professional journals, presentation at conferences, or competition in contests. Such experience is valuable for graduate school and later professional life. Your Honors work will be recognized at your graduation, on your permanent transcript, and on your diploma. It is often accompa-
The Faculty

Electrical and Computer Engineering

Uma Balaji, 2005, Assist Professor, PhD, U Victoria.
Adel Gandakly, 2005, Chair, Professor, PhD, U Calgary.
Hede Ma, 2000, Professor, PhD, SUNY Binghamton.
Albert O. Richardson, 1989, Professor, PhD, Pennsylvania State U.
Ben-Dau Tseng, 1982, Professor, PhD, U Windsor.
Dale Word, 2002, Assist Professor, MS, CSU Chico.

Emeritus Faculty

Richard A. Bednar, 1979, Professor Emeritus, PE, PhD, Michigan State U.
Roy E. Crobie, 1983, Director of Academic Develop., Professor Emeritus, PhD, U Liverpool.
Arthur Gee, 1977, Professor Emeritus, PE, MSEE, Polytechnic U.
Louis R. Harrold, 1984, Professor Emeritus, MSEE, UC Davis.
Philip H. Hoff, 1970, Professor Emeritus, PhD, UC Berkeley.
William G. Lane, 1960, Professor Emeritus, PE, PhD, UC Davis.
Larry L. Wear, 1972, Professor Emeritus, PhD, Santa Clara U.
John J. Zenor, 1982, Professor Emeritus, PhD, U Missouri.
PE designates Registered Professional Engineer

Electrical and Computer Engineering

Course Offerings

Survey of topics from the fields of electrical and computer engineering. Applications of critical thinking to the solution of engineering problems. Using the computer and sensors to control mechanical devices.

EECE 101 Introduction to Electrical and Computer Engineering 2.0 Fa/Spr

EECE 110 Basic Electricity and Instruments 3.0 Fa/Spr
Prerequisites: None. This course is not intended for engineering majors.
Introduces students to the software development life cycle and the elements of a computer system. Teaches the syntax common to both C and C++. Shows how to split large program into segments and explains the role of algorithms in programming. Programming assignments are taken from simple engineering and mathematics problems.

EECE 135 Algorithms and Programs for Engineers 3.0 Fa/Spr
Prerequisites: MATH 120 is recommended.
Introduces students to the software development life cycle and the elements of a computer system. Teaches the syntax common to both C and C++. Shows how to split large program into segments and explains the role of algorithms in programming. Programming assignments are taken from simple engineering and mathematics problems.

EECE 144 Logic Design Fundamentals 4.0 Fa/Spr
Prerequisites: Recommended: EECE 101, MECH 100.

EECE 144X Logic Design Session 1.0 Fa/Spr
Corequisites: EECE 144.

EECE 198 Special Topics 1.0–3.0 Inquire
This course is for special topics offered for 1.0–3.0 units. Typically the topic is offered on a one-time-only basis and may vary from term to term and be different for different sections. See the Class Schedule for the specific topic being offered. 3.0 hours activity.

EECE 211 Linear Circuits I 3.0 Fa/Spr
Prerequisites: MATH 121, PHYS 204B.
DC and sinusoidal circuit analysis, including resistive, capacitive, and inductive circuit elements and independent sources. Ideal transformer, Thevenin and Norton circuit theorems and superposition. Phasors, impedence, resonance, and AC power. Three-phase AC Circuit analysis. CAN ENGR 6.

EECE 211L Linear Circuits I Activity 1.0 Fa/Spr
Corequisites: EECE 211.
Experiments to reinforce the principles taught in EECE 211. The combination of EECE 211 and EECE 211L is equivalent to CAN ENGR 6. 2.0 hours activity.

EECE 211X Circuits Problem Session 1.0 Fa/Spr
Prerequisites: Concurrent enrollment in EECE 211.
Designed to supplement EECE 211 with additional applications and extended explanations of concepts encountered in the first circuits course. Provides the student with the opportunity for additional assistance in analyzing and designing circuits. 2.0 hours activity. Credit/no credit grading only.
EECE 221  Processor Architecture and Assembly Language Programming  3.0 Fa/Spr
Prerequisites: Either CSCI 111 or EECE 135.
An introduction to the components that make up a processor and the organization of those components. The representation of numbers, data, and instructions within a processor along with the ways they are addressed. Assembly language programming using arithmetic, logical, test, and input/output instructions. 2.0 hours lecture, 2.0 hours activity.

EECE 311  Linear Circuits II  4.0 Fa/Spr
Prerequisites: EECE 211; MATH 260 (may be taken concurrently).

EECE 315  Electronics I  4.0 Fa/Spr
Prerequisites: EECE 211, EECE 211L.
Corequisites: EECE 311, MATH 260.
Topics include qualitative and quantitative analysis of bandwidths, response times, error detection and recovery, interrupts, and system throughput; digital filters, block and coprocessors, factor and parallel architectures.

EECE 320  System Architecture and Performance  3.0 Fall
Prerequisites: Either CSCI 320 or EECE 344 (may be taken concurrently).
Study of computing architecture and how the structure of various hardware and software modules affects the ultimate performance of the total system. Topics include selection of architecture; interconnection network topology; hardware and software documentation standards are described. Methodologies for modeling systems and development of presentation materials are discussed. Students are required to make both written and oral presentations. 2.0 hours discussion, 2.0 hours activity. This course is also offered as CSCI 305.

EECE 337  Project Requirements, Design, and Testing  3.0 Fa/Spr
Prerequisites: ENGL 130, either CSCI 112 or EECE 221.
Students are introduced to methodologies used to specify system descriptions. Hardware and software documentation standards are described. Methodologies for modeling systems and development of presentation materials are discussed. Students are required to make both written and oral presentations. 2.0 hours discussion, 2.0 hours activity. This course is also offered as CSCI 305.

EECE 343  Computer Interface Circuits  4.0 Fa/Spr
Prerequisites: EECE 144, EECE 221; either CSCI 110 or EECE 211L.
Extends the study of digital circuits to LSI and VLSI devices. Use of computer simulation in circuit design and analysis is emphasized. CAP tools as PSPICE and Altera MAX-MPLIUS II are used. Pulse and digital wave generation and shaping, sinusoidal oscillators, high-frequency amplifiers, active filters, power supply regulators, power electronics, advanced linear I.C.s. 3.0 hours discussion, 2.0 hours activity.

EECE 344  Digital Systems Design  4.0 Fa/Spr
Prerequisites: EECE 144, EECE 221; either CSCI 110 or EECE 211L.
Extends the study of digital circuits to LSI and VLSI devices. Use of computer simulation in circuit design and analysis is emphasized. CAD tools as PSPICE and Altera MAX-MPLUS II are used. Pulse and digital wave generation and shaping, sinusoidal oscillators, high-frequency amplifiers, active filters, power supply regulators, power electronics, advanced linear I.C.s. 3.0 hours discussion, 2.0 hours activity. This course is also offered as CSCI 305.

EECE 399  Special Topics  1.0–3.0 Fa/Spr
Prerequisites: EECE 144, EECE 211, EECE 211L, EECE 221.
This course offers an opportunity for independent study of special topics offered for IEEE Microcomputer Design and Construction. Constraints placed on the course are discussed. Students are required to make both written and oral presentations. 2.0 hours discussion, 2.0 hours activity. This course may be taken more than once for a maximum of 2.0 units.

EECE 389  Internship in Electrical and Computer Engineering  1.0–3.0 Inquire
This internship is offered for 1.0–3.0 units. Students must register directly with a supervising faculty member. You may take this course more than once for a maximum of 15.0 units.

EECE 398  Special Problems  1.0–3.0 Fa/Spr
Prerequisites: EECE 315.
This course is for special problems offered for 1.0–3.0 units. The topics are offered on a one-time basis and may vary from term to term and be different for different sections. See the Class Schedule for the specific topic being offered.

EECE 413  Consumer Electronics  4.0 Inquire
Prerequisites: EECE 316.
Engineering analysis of consumer electronic equipment: radio receivers, audio and video tape recorders, and television. Other topics will be covered as time permits and student interest directs.

EECE 417  Radio Frequency Circuits  4.0 Fall
Prerequisites: Either CSCI 320 or EECE 320.
Characteristics of passive and active components at high frequencies, reflections and standing waves, matching networks, scattering parameters, high-frequency measurement equipment and techniques, sample high-frequency design and construction projects, Smith charts. 3.0 hours lecture, 3.0 hours laboratory.

EECE 425  Advanced Computer Architecture  4.0 Spring
Prerequisites: Either CSCI 320 or EECE 320.
The application, design, and performance aspects of parallel processor systems, arithmetic pipelining and vector processing units, architectural classification; memory structures, multiprocessor systems; interconnection networks, multiprocessing control and scheduling; parallel algorithms.

EECE 427  Topics in Systems and Architecture  4.0 Inquire
Prerequisites: Either CSCI 311 or EECE 344.
Study of selected topics in the area of computer systems and computer architecture. Fault-tolerant systems, system reliability, and redundancy in hardware and software are usually included.

EECE 431  Software Engineering—Requirements and Design  3.0 Fall
Prerequisites: CSCI 112.
This course presents the concepts and techniques associated with designing, developing, and testing real-time and embedded systems. Topics include the nature and uses of real-time systems, architecture and design of real-time systems, embedded development and debugging environments, embedded programming techniques, real-time operating systems and real-time scheduling and algorithms. Special attention is given to the study of real-time process scheduling and performance, including mathematical analysis of scheduling algorithms.

EECE 444  Microprocessor Systems Design  4.0 Spring
Prerequisites: EECE 344.
Advanced microprocessor design concepts and techniques. Timing considerations and calculations for reliable high-speed processor operating frequencies. Interrupts for real-time processing; interfacing microprocessors to Dynamic Random Access Memories. Designing DRAM controllers using state machine design procedures. Direct Memory Access Controllers (DMAs) and multi-master systems. Programmable Parallel Ports and Timers. Special purpose processors for digital signal processing, communication and multimedia applications. 3.0 hours discussion, 2.0 hours activity. Special fee required; see the Class Schedule.
EECE 447 Introduction to VLSI Systems 4.0 Inquire
Prerequisites: EECE 144, EECE 315.
Design of VLSI circuits. Emphasis is on design methodologies, including the use of CAD tools for schematic capture, chip layout, circuit simulation, and fault/timing analysis.

EECE 450 Optics 3.0 Spring
Prerequisites: PHYS 204B, PHYS 204C.
Geometrical and physical optics, interference, diffraction, reflection, dispersion, resolution, polarization, fiber optics, laser optics, and holography. 2.0 hours discussion, 3.0 hours laboratory. This course is also offered as PHYS 450.

EECE 451 Lasers and Their Applications 3.0 Fall
Prerequisites: PHYS 204C.
Recommended: EECE 450.
The theory and mechanism of laser action, various types of lasers and their applications and future use. Laboratory involves measurements with lasers, fiber optics, data transmission, and holography. 2.0 hours discussion, 3.0 hours laboratory. This course is also offered as PHYS 451.

EECE 453 Communication Systems Design 4.0 Spring
Prerequisites: EECE 165, CIVL 302 or MATH 350.

EECE 455 Introduction to Network Engineering 4.0 Fall
Prerequisites: Either CSCI 320 or EECE 344.
Computer network architecture is reviewed. Network components such as hubs, routers, and bridges are discussed. Transmission media and protocols are discussed. Concepts of data communications are reviewed.

EECE 465 Digital Signal Processing 4.0 Spring
Prerequisites: EECE 165 (may be taken concurrently).
Properties of continuous and discrete signals. Z-transform and Fast-Fourier Transform. Digital filtering techniques. Finite word length effects on digital signal processing elements. 3.0 hours discussion, 2.0 hours activity.

EECE 479 Topics in Robotics and Control Systems 4.0 Inquire
Prerequisites: EECE 165.
Study of selected topics in the area of robotics and control systems such as system simulation and modeling, and discrete-time control systems.

EECE 481 Electromechanical Conversion 4.0 Fall
Prerequisites: EECE 211.
Principles of electromechanical conversion, traditional and renewable energy sources, magnetic circuits and steady state performance of synchronous, dc and induction motors, state space models and dynamic performance of electric motors, linearized models and common control schemes for various motors.

EECE 482 Control System Design 4.0 Fall
Prerequisites: EECE 211, MATH 260. Recommended: MECA 380, MECH 320; either EECE 135 or MECH 106.
Modeling and simulation of dynamic system performance. Control system design for continuous systems using both analog and digital control techniques. 3.0 hours lecture, 2.0 hours activity. Special fee required; see the Class Schedule. This course is also offered as MECA 482.

EECE 490A Senior Project Design and Documentation 3.0 Fa/Spr
Prerequisites: ENGL 130 (or its equivalent) with a grade of C– or higher; EECE 144, EECE 344; either EECE 316 or EECE 444 (may be taken concurrently).
Students prepare, plan, design, and document a senior project. The complete design and documentation process must include the project concept with ethical, environmental, and social impact; project requirements; full and complete design; work schedule. Requirements and design address human factors, safety, reliability, maintainability, and customer cost. In addition to communicating and documenting the project, the oral and written reports meet the University’s writing proficiency requirement and provide materials for evaluating several ABET outcomes assessment criteria. 1.0 hours lecture, 4.0 hours activity. This is a writing proficiency course; a grade of C– or better certifies writing proficiency for majors.

EECE 490B Senior Project Implementation 2.0 Fa/Spr
Prerequisites: EECE 490A, either EECE 316 or EECE 444.
In a continuation of EECE 490A, students complete detailed designs, construct, test, and demonstrate their senior design project. Design documentation must address sustainability, manufacturability and, if appropriate, health and safety issues. Formal oral and written reports documenting the project are required. 4.0 hours activity.

EECE 498 Advanced Topics 1.0–5.0 Inquire
Prerequisites: To be established when courses are formulated.
This course is for special topics offered for 1.0–5.0 units. Typically the topic is offered on a one-time-only basis and may vary from term to term and be different for different sections. See the Class Schedule for the specific topic being offered.

EECE 499 Independent Study 1.0–3.0 Fa/Spr
This course is an independent study of special problems and is offered for 1.0–3.0 units. You must register directly with a supervising faculty member. You may take this course more than once for a maximum of 6.0 units. Credit/no credit grading only.

EECE 499H Honors Project 3.0 Inquire
Prerequisites: ENGL 130 (or its equivalent) with a grade of C– or higher, faculty permission: completion of all junior-level EECE courses required in major.
This course may be taken twice for a maximum of 6 units. Prerequisite to the second semester is a “B” or higher in the first semester. Open by invitation to EE and CMPE majors who have a GPA among the top 5% of ECE students based upon courses taken at CSU, Chico. This is an “Honors in the Major” course; a grade of “B” or higher in 6 units of EECE 499H certifies the designation of “Honors in the Major” to be printed on the transcript and the diploma. Each 3-unit course will require both formal written and oral presentations. You may take this course more than once for a maximum of 6.0 units. This is a writing proficiency, WP, course; a grade of C– or better certifies writing proficiency for majors.

EECE 615 High-Frequency Design Techniques 4.0 Fall
Prerequisites: EECE 315, PHYS 204C.
Study of the problems associated with passive components at high frequencies, high-frequency measurement techniques, transmission lines, line reflections, matching and terminations, scattering parameters, ground and power planes, and printed circuit board design considerations.

EECE 617 High-Frequency Analog Design 4.0 Spring
Prerequisites: EECE 417, EECE 615.
Design, analysis and construction of high-frequency amplifiers, oscillators and mixers are covered in this course.

EECE 631 Processes Improvement 4.0 Spring
Prerequisites: CSCI 130 or EECE 431.
Explore the Capability Maturity Model (CMM) developed by the Software Engineering Institute process maturity model; examine the differences between the CMM and ISO 9001; understand the key process areas for the CMM levels 2 and 3; participate in peer reviews and other quality assurance methods.

EECE 636 Project Implementation and Testing 4.0 Inquire
Prerequisites: CSCI 630.
This course is for students who have completed a graduate course in project requirements analysis and design. The class project involves implementation and testing of a large software system. Topics include advanced implementation and automated testing techniques.

EECE 639 Topics in Software Engineering 4.0 Fall
Prerequisites: EECE 431.
Study of advanced topics in software engineering as presented in recent journals. Topics reflect research interest of department faculty.

EECE 643 Computer-Aided Circuit Engineering 4.0 Spring
Prerequisites: EECE 615.
The use of computer-aided design tools to analyze, design, and test both analog and digital circuits and devices.

EECE 655 Topics in Computer Networking 4.0 Spring
Prerequisites: EECE 344, EECE 455.

EECE 659 Topics in Communication Systems 4.0 Inquire
Prerequisites: EECE 453.
Advanced study of selected topics in the area of communication systems such as error detection and correction, information encoding and decryption, and real-time performance. Other topics include material in recently published journals and research projects of department faculty. You may take this course more than once for a maximum of 8.0 units.

EECE 669 Topics in Digital Signal Processing 4.0 Inquire
Prerequisites: EECE 465.
Study of selected topics in the area of digital signal processing such as computer-aided filter design, two-dimensional signal processing, DSP chips, and pattern recognition. Other topics include material in recently published journals and research projects of department faculty. You may take this course more than once for a maximum of 8.0 units.

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The objective of the Electrical/Electronic Engineering Program is to prepare students to communicate their thoughts, in both written and oral forms, so that others can comprehend and build on their work. They will also appreciate the importance of ethics in the profession and the need to act in society's best interest.

Electrical/Electronic Engineering Design Experience

Design is a fundamental aspect of the electrical/electronic engineering curriculum, and it is integrated into the curriculum in the freshman year where students are introduced to both hardware and software design. As students expand their knowledge and analysis skills through the sophomore and junior years, the design problems they are assigned increase in complexity. Design problems are assigned in analog electronics, digital systems, control systems, and digital signal processing.

The design experience culminates in the senior year when all students are required to identify a design project, create testable requirements to the project, design the project, and construct the project to prove the design works. In the past, students have designed computer-controlled robots, digital signal processing systems, communication systems, remote video control and display systems, and audio systems.

The Bachelor of Science in Electrical/Electronic Engineering

Total Course Requirements for the Bachelor's Degree: 132 units

See “Requirements for the Bachelor's Degree” in the University Catalog for complete details on general degree requirements. A minimum of 40 units, including those required for the major, must be upper division.

A suggested Major Academic Plan (MAP) has been prepared to help students meet all graduation requirements within four years. Please request a plan from your major advisor or visit it and other current advising information on the CSU, Chico Web.

General Education Requirements

Electrical/Electronic Engineering is a major with modifications to the University's General Education Requirements. The following requirements, together with the approved General Education courses required for the Electrical/Electronic Engineering major (marked with an * below), fulfill the General Education Requirement.

1. Select two courses, one from each of the Core Areas A1 and A2.
2. Select one course from Breadth Area B2.
3. Select one course from Breadth Area C1 or C2 or C3. A course that also fulfills the Ethnic or Non-Western requirement is recommended.
4. Upper-division theme modification has been approved for this major. See “General Education” in the University Catalog for specifics on how to apply this modification.

Cultural Diversity Course Requirements: 6 units

See “Cultural Diversity” in the University Catalog. Most courses used to satisfy these requirements may also apply to General Education Areas C and D.

American Institutions Requirement: 6 units

This requirement is normally fulfilled by completing HIST 130 and POLS 155. For other alternatives, see the “Bachelor's Degree Requirements” section.

Literacy Requirement:

See “Mathematics and Writing Requirements” in the University Catalog. Writing proficiency in the major is a graduation requirement and may be demonstrated through satisfactory completion of a course in your major which has been designated as the Writing Proficiency (WP) course for the semester in which you take the course. Students who earn below a C– are required to repeat the course and earn a C– or better to receive WP credit. See the Class Schedule for the designated WP courses for each semester. You must pass ENGL 130 (or its equivalent) with a C– or better before you may register for a WP course.

Course Requirements for the Major: 105 units

The following courses, or their approved transfer equivalents, are required of all candidates for this degree.

Lower-Division Requirements: 48 units

14 courses required:

CHE 111 General Chemistry 4.0 FS *
Prerequisites: Second-year high school algebra; one year high school chemistry. (One year of high school physics and one year of high school mathematics past Algebra II are recommended.)

ECE 101 Intro Elec/Computer Engr 2.0 FS
ECE 135 Algorithms & Progs for Engrs 3.0 FS
Prerequisites: MATH 120 is recommended.

ECE 144 Logic Design Fundamentals 4.0 FS
Prerequisites: Recommended: EECE 101, MECH 100.
EECE 211 Linear Circuits I 3.0 FS
Prerequisites: MATH 121, PHYS 204B.
EECE 211L Linear Circuits I Activity 1.0 FS
Corequisites: EECE 211.
EECE 221 Processor Arch/Assembly Lang 3.0 FS
Prerequisites: Either CSCI 111 or EECE 135.
MATH 120 Analytic Geometry and Calculus 4.0 FS *
Prerequisites: Completion of ELM requirement; both MATH 118 and MATH 119 (or high school equivalent); a score that meets department guidelines on a department administered calculus readiness exam.
Prerequisites must be completed with a C– or higher.
MATH 121 Analytic Geometry and Calculus 4.0 FS
Prerequisites: MATH 120.
Prerequisites must be completed with a C– or higher.
MATH 220 Analytic Geometry and Calculus 4.0 FS
Prerequisites: MATH 121.
Prerequisites must be completed with a C– or higher.
MATH 260 Elem Differential Equations 4.0 FS
Prerequisites: MATH 121.
Prerequisites must be completed with a C– or higher.
PHYS 204A Mechanics 4.0 FS *
Prerequisites: High school physics or faculty permission. Concurrent enrollment in or prior completion of MATH 121 (second semester of calculus) or equivalent.
PHYS 204B Electricity and Magnetism 4.0 FS
Prerequisites: MATH 121, PHYS 204A with a grade of C– or higher.
PHYS 204C Heat/Wave Motion/Sound/Light 4.0 FS
Prerequisites: MATH 121, PHYS 204A with a grade of C– or higher.
Upper-Division Requirements: 57 units
15 courses required:
CIVL 302 Engineering Econ & Statistics 3.0 FS
Prerequisites: MATH 121; junior standing.
CIVL 495 Lifelong Development Engineers 3.0 FS
Prerequisites: ENGL 130 or equivalent; senior standing.
EECE 311 Linear Circuits II 4.0 FS
Prerequisites: EECE 211; MATH 260 (may be taken concurrently).
EECE 315 Electronics I 4.0 FS
Prerequisites: EECE 211, EECE 211L.
Corequisites: EECE 311, MATH 260.
EECE 316 Electronics II 4.0 SP
Prerequisites: EECE 315.
EECE 335 Proj Requirements/Design/Test 3.0 FS
Prerequisites: ENGL 310, either CSCI 112 or EECE 221.
This course is also offered as CSCI 310.
EECE 343 Computer Interface Circuits 4.0 FS
Prerequisites: EECE 144, EECE 315.
EECE 344 Digital Systems Design 4.0 FS
Prerequisites: EECE 144, either EECE 110 or EECE 211 and EECE 211L.
EECE 365 Signals and Transforms 4.0 FS
Prerequisites: EECE 311, MATH 260.
EECE 375 Fields and Waves 3.0 SP
Prerequisites: EECE 211, EECE 211L, MATH 260.
EECE 453 Communication Systems Design 4.0 SP
Prerequisites: EECE 365; CIVL 302 or MATH 150.
EECE 465 Digital Signal Processing 4.0 SP
Prerequisites: EECE 365 (may be taken concurrently).
EECE 482 Control System Design 4.0 FA
Prerequisites: EECE 211, MATH 260. Recommended: MECA 380, MECH 320; either EECE 135 or MECH 306.
This course is also offered as MECA 482.
EECE 490A Senior Project Design/Document 3.0 FS WP
Prerequisites: ENGL 130 (or its equivalent) with a grade of C– or higher;
EECE 343, EECE 344; either EECE 316 or EECE 444 (may be taken concurrently).
EECE 490B Senior Project Implementation 2.0 FS
Prerequisites: EECE 490A; either EECE 316 or EECE 444.
CIVL 302 and CIVL 495 are approved General Education courses for Electrical/Electronic Engineering majors.
4 units selected from:
Any approved upper-division engineering, science, or math courses not otherwise required for graduation.
Grading Requirement:
All courses taken to fulfill major course requirements must be taken for a letter grade except those courses specified by the department as Credit/No Credit grading only.
All students must attain a 2.0 Grade Point Average (GPA) in all college courses attempted and for all courses attempted at Chico. Electrical/Electronic Engineering majors must also attain a 2.0 GPA in:
(a) All courses required for the major, and
(b) All Electrical and Computer Engineering (ECE) courses taken to meet major requirements at CSU, Chico.
Advising Requirement:
Advising is mandatory for all majors in this degree program. Consult your undergraduate advisor for specific information.
A sample program for students who wish to complete their major in four years is available upon written request to the Department of Electrical and Computer Engineering, CSU, Chico, CA 95929-0888.
Please see Honors in the Major under Computer Engineering.
The Master of Science in Electrical and Computer Engineering
The MS in Electrical and Computer Engineering is designed to serve those students who wish to obtain advanced knowledge in the design of high-speed electronic systems or computer-based systems. This knowledge prepares students for a doctoral program or an intermediate level position in industry.
Course Requirements for the Master's Degree: 30 units
Continuous enrollment is required. A maximum of 9 semester units of transfer and/or CSU Chico Open University course work may be applied toward the degree.
Graduate Time Limit:
All requirements for the degree are to be completed within five years of the end of the semester of enrollment in the oldest course applied toward the degree. See “Graduate Education” in the University Catalog for complete details on general degree requirements.
Program Selection
Students will choose either the Option in Computer Engineering or the Option in Electronic Engineering.
MS in Electrical and Computer Engineering with an Option in Computer Engineering:
This option is designed primarily for students who wish to apply electrical and software engineering principles to the design and development of computers and computer-based systems.
MS in Electrical and Computer Engineering with an Option in Electronic Engineering:
This option is designed primarily for students who wish to expand their skills in the design and development of electronic systems or computer-based systems. This knowledge prepares students for a doctoral program or an intermediate level position in industry.
In addition to any requirements listed above:
1. Successful completion of the Graduate Writing Examination.
2. Completion of background preparation equivalent to the following undergraduate courses: EECE 135, EECE 221, EECE 315, EECE 343, and EECE 344, EECE 365.
All required undergraduate electrical and computer engineering (ECE) courses must be taken for a letter grade, and a grade of C or better must be earned in each course. Students are required to complete the background courses immediately as a matter of reasonable progress toward the master's degree.
Advancement to Candidacy:
In addition to any requirements listed above:
1. Formation of the graduate advisory committee in consultation with the Graduate Coordinator.
2. Development of an approved program, including a thesis or project proposal if the thesis or project plan is chosen, in consultation with the Graduate Coordinator.
3. Classified graduate standing and completion at the University of at least 9 units of the proposed program with a minimum 3.00 grade point average.
Requirements for the MS Degree in Electrical and Computer Engineering

Completion of all requirements as established by the department graduate committee, the graduate advisory committee, and the Office of Graduate Studies, to include:

1. Completion of an approved program consisting of 30 units of 400/500/600-level courses as follows:
   (a) Completion of the 12-unit core:
      - EECE 455: Intro to Network Engineering 4.0 FA
      - EECE 615: High Frequency Design Techs 4.0 FA
      - EECE 643: Computer-Aided Circuit Engr 4.0 SP
   (b) At least 18 units, including a thesis or project if chosen, must be in electrical and computer engineering (EECE); remaining units may be selected from electrical or computer engineering or in related areas with the approval of the Graduate Coordinator.
   (c) At least 18 of the units required for the degree must be 600-level courses.
   (d) Not more than 9 semester units of transfer and/or extension credit (correspondence courses and U.C. extension course work are not acceptable); Open University course work is included in this 9 unit total.

2. Completion and final approval of one of the following three plans as specified by the graduate advisory committee:
   (a) Thesis Plan. This plan includes 24 units of course work and 6 units of thesis research (EECE 699T). Research may be theoretical or applied, but must reflect an individual in-depth study into an approved topic. This plan requires a formal research thesis which must be submitted to the Office of Graduate Studies for approval and access to the library.
   (b) Project Plan. Requirements for this plan consist of 27 units of course work and 3 units of project preparation (EECE 699P). The project must show how analysis and design have been applied to a particular area of electronic or computer engineering. A written project description must be submitted to the Office of Graduate Studies for approval and access to the library.
   (c) Examination Plan. Requirements for this plan consist of 30 units of course work and a comprehensive oral examination prepared by the faculty. The two-hour examination will cover areas covered in four courses from the candidate's course of study.

3. Approval by the Graduate Coordinator and the Graduate Coordinators Committee on behalf of the faculty of the University.

Option in Computer Engineering: 18 units

Undergraduate background:
- Programming in C++ and assembly language
- Data structures
- Operating systems
- Signals and transistors
- Analog electronics
- Digital systems and state machine design
- Computer interface circuits
- Microprocessor system design

8 units selected from:
- EECE 425: Advanced Computer Architecture 4.0 SP
- EECE 631: Processes Improvement 4.0 SP
- EECE 655: Topics in Comp Networking 4.0 SP
- EECE 643: Computer-Aided Circuit Engr 4.0 SP

10 units selected from:
- Any approved senior or graduate-level courses not otherwise required for the degree.

Option in Electronic Engineering: 18 units

Undergraduate background:
- Programming in C++ and assembly language
- Signals and transistors
- Advanced analog electronics
- Digital systems design
- Computer interface circuits
- Control systems
- Digital Signal Processing
- Communication Systems

8 units selected from:
- EECE 417: Radio Frequency Circuits 4.0 FA

Graduate Literacy Requirement:

Writing proficiency is a graduation requirement.

Graduate Grading Requirements:

All courses in the major (with the exception of Independent Study—597/697, Comprehensive Examination—696, Master's Project—699P, and Master's Thesis—699T) must be taken for a letter grade, except those courses specified by the department as ABC/No Credit (400/500-level courses), AB/No Credit (600-level courses), or Credit/No Credit grading only. A maximum of 10 units combined of ABC/No Credit, AB/No Credit, and Credit/No Credit grades may be used on the approved program (including 597/697, 696, 699P, 699T and courses outside the major). While grading standards are determined by individual programs and instructors, it is also the policy of the University that unsatisfactory grades may be given when work fails to reflect achievement of the high standards, including high writing standards, expected of students pursuing graduate study.

Students must maintain a minimum 3.0 grade point average in each of the following three categories: all course work taken at any accredited institution subsequent to admission to the master's program; all course work taken at CSU, Chico subsequent to admission to the program; and all courses on the approved master's degree program.

In addition, students may not count more than two courses in which they received a grade of C toward the approved program.

The Faculty

Please see Computer Engineering for faculty listing.

Course Offerings

Please see Computer Engineering for course offerings.

Mechanical Engineering

Mechanical engineering includes mechanical design, thermal-fluid systems, applied mechanics, and automation. The mechanical engineering student is prepared in all of these areas in order to analyze and design complex mechanical systems. Graduates can specialize in areas such as energy conversion systems, mechanisms and machines, manufacturing, materials, and automation through electives.

Mechanical Engineering Program Mission

The mechanical engineering program has the primary mission of providing students a high-quality undergraduate engineering education with:

- A curriculum that is firmly grounded in engineering fundamentals
- A faculty that provides superior teaching and mentoring both in and out of the classroom
- A faculty whose focus is undergraduate education
- Class sizes that encourage student participation
- Project experiences that build on fundamentals and develop team skills
- Facilities and equipment that are readily accessible
- An environment that is conducive to learning and encourages students from different genders and backgrounds.

We are committed to offer a broad undergraduate experience that will promote professional growth and prepare students for a variety of engineering careers, graduate studies, and continuing education.

Mechanical Engineering Program Educational Objectives

The program's educational objectives are best framed in terms of goals for its graduates. Mechanical engineering graduates will:

- Be effective engineers and problem solvers.
- Be well educated in the mechanical engineering sciences.
- Be able to use engineering tools that will enhance their productivity.
- Be familiar with current technology and how it can be incorporated into their design, analysis, and testing activities including an understanding of manufacturing methods and the use of computers, sensors, and actuators to automate machines and processes.
Engineering

• Be effective oral, written, and graphical communicators.
• Be able to function effectively as members of multi-disciplinary teams.
• Have an appreciation for the individual, society, and human heritage, and be aware of the impact of their designs on human-kind and the environment.
• Be prepared for a variety of engineering careers, graduate studies, and continuing education.

Mechanical Engineering Design Experience
The mechanical engineering program at CSU, Chico is a traditional balance of engineering science and design. The design sequence for mechanical engineers is a progressive one. The courses which are primarily devoted to design are:

MECH 140—Introduction to Engineering Design
MECH 340—Mechanical Engineering Design
MECH 440A—Mechanical Engineering Design Project I
MECH 440B—Mechanical Engineering Design Project II

The freshman experience (MECH 140) focuses on the creative aspects of design and gives students an opportunity to practice the engineering design process with little or no emphasis on engineering science. At the junior level (MECH 340), there is an opportunity to learn about safety, failure, reliability, codes and standards, and economic considerations, while carrying out detailed design of mechanical components. In the final senior project (MECH 440A and MECH 440B), students are expected to exercise what they learned throughout the preceding design courses in a final project that includes manufacturing and testing, as well as the more global aspects of design including product realization, economic factors, environmental issues, and social impact. Together, these experiences prepare graduates to be successful practitioners with an awareness of the multitude of issues involved.

The Bachelor of Science in Mechanical Engineering

Total Course Requirements for the Bachelor’s Degree: 132 units

See “Requirements for the Bachelor’s Degree” in the University Catalog for complete details on general degree requirements. A minimum of 40 units, including those required for the major, must be upper division.

A suggested Major Academic Plan (MAP) has been prepared to help students meet all graduation requirements within four years. Please request a plan from your major advisor or view it and other current advising information on the CSU, Chico Web.

General Education Requirement
Mechanical Engineering is a major with modifications to the University’s General Education Requirements. The following requirements, together with the approved General Education courses required for the Mechanical Engineering major (marked with an * below), fulfill the General Education Requirement.

1. Select two courses, one from each of the Core Areas A1 and A2.
2. Select one course from Breadth Area B2.
3. Select one course from Breadth Area C1 or C2 or C3.
4. Select one course from Breadth Area D1 or D2 or D3.
5. Upper-division theme modification has been approved for this major. See “General Education” in the University Catalog for specifics on how to apply this modification.

Cultural Diversity Requirement: 6 units

Complete two Cultural Diversity courses, one Ethnic and one Non-Western. (See the “Bachelor’s Degree Requirements” section.) Both courses must also satisfy one of the General Education requirements in order for 132 units to fulfill all requirements for the Mechanical Engineering degree.

American Institutions Requirement: 6 units

This requirement is normally fulfilled by completing HIST 130 and POLS 155. For other alternatives, see the “Bachelor’s Degree Requirements” section.

Literacy Requirement:
See “Mathematics and Writing Requirements” in the University Catalog. Writing proficiency in the major is a graduation requirement and may be demonstrated through satisfactory completion of a course in your major, which has been designated as the Writing Proficiency (WP) course for the semester in which you take the course. Students who earn below a C– are required to repeat the course and earn a C– or better to receive WP credit. See the Class Schedule for the designated WP courses for each semester. You must pass ENGL 130 (or its equivalent) with a C– or better before you may register for a WP course.

Course Requirements for the Major: 105 units

The following courses, or their approved transfer equivalents, are required of all candidates for this degree.

Lower-Division Requirements: 52 units

17 courses required:

CIVL 211 Statics 3.0 FS
Prerequisites: MATH 121 and PHYS 204A. CIVL 110 (may be taken concurrently) or MATH 100 and MATH 119 (may be taken concurrently).
CHEM 111 General Chemistry 4.0 FS *
Prerequisites: Second-year high school algebra; one year high school chemistry. (One year of high school physics and one year of high school mathematics past Algebra II are recommended.)
EECE 211 Linear Circuits I 3.0 FS
Prerequisites: MATH 121, PHYS 204A.
EECE 211L Linear Circuits I Activity 1.0 FS
Corequisites: EECE 211.
MATH 120 Analytic Geometry and Calculus 4.0 FS *
Prerequisites: Completion of MATH 118 and MATH 119 (or high school equivalent); a score that meets department guidelines on a depart-
ment administered calculus readiness exam.
Prerequisites must be completed with a C– or higher.
MATH 121 Analytic Geometry and Calculus 4.0 FS
Prerequisites: MATH 120.
Prerequisites must be completed with a C– or higher.
MATH 220 Analytic Geometry and Calculus 4.0 FS
Prerequisites: MATH 121.
Prerequisites must be completed with a C– or higher.
MATH 260 Elem Differential Equations 4.0 FS
Prerequisites: MATH 121.
Prerequisites must be completed with a C– or higher.
MECH 100 Graphics 1.0 FS
Corequisites: MECH 100L.
MECH 100L Graphics I Laboratory 1.0 FS
Corequisites: MECH 100.
MECH 140 Intro to Engineering Design 3.0 FS
Prerequisites: MATH 121.
MECH 200 Graphics II 2.0 FS
Prerequisites: MECH 100 and MECH 100L.
MECH 210 Materials Science/Engineering 3.0 FS
Prerequisites: PHYS 204A; CHEM 111.
MFGT 160 Manufacturing Processes 3.0 FS
Prerequisites: Completion of MATH 121 (second semester of calculus) or equivalent.
PHYS 204A Mechanics 4.0 FS *
Prerequisites: High school physics or faculty permission. Concurrent enrollment in or prior completion of MATH 121 (second semester of calculus) or equivalent.
PHYS 204B Electricity and Magnetism 4.0 FS *
Prerequisites: MATH 121, PHYS 204A with a grade of C– or higher.
PHYS 204C Heat/Wave Motion/Sound/Light 4.0 FS
Prerequisites: MATH 121, PHYS 204A with a grade of C– or higher.

Upper-Division Requirements: 53 units

15 courses required:

CIVL 301 Engineering Econ & Statistics 3.0 FS
Prerequisites: MATH 121, junior standing.
CIVL 311 Strength of Materials 4.0 FS
Prerequisites: CIVL 211 with a grade of C– or higher; CIVL 110 and MATH 100 and MATH 100L; MATH 260 and MATH 210 (may be taken concurrently).
CIVL 321 Fluid Mechanics 4.0 FS
Prerequisites: CIVL 211 with a grade of C– or higher.
Recommended: MATH 260, MECH 320 (may be taken concurrently).
CIVL 495 Lifelong Development Engineers 3.0 FS
Prerequisites: ENGL 130 or equivalent; senior standing.
MECA 380 Measurements & Instrumentation 3.0 SP
Prerequisites: ECE 211, ECE 211L; either ECE 135 or MECH 306. Recommended: CIVL 302.
MECA 482 Control System Design 4.0 FA
Prerequisites: ECE 211, MATH 260. Recommended: MECA 380, MECH 320; either ECE 135 or MECH 306.
This course is also offered as ECE 482.
MECH 306 Thermodynamics 4.0 FA
Prerequisites: MATH 260. Recommended: PHYS 204A.
MECH 308 Finite Element Analysis 3.0 SP
Prerequisites: CIVL 311 with a grade of C– or higher, MATH 306.
Recommended: MECH 210, PHYS 204C.
MECH 320 Dynamics 3.0 FS
Prerequisites: CIVL 311 with a grade of C– or higher, MATH 260.
MECH 322 Thermodynamics 3.0 FS
Prerequisites: PHYS 204A. Recommended: PHYS 204C.
MECH 338 Heat Transfer 4.0 SP
Prerequisites: CIVL 321, MECH 332. Recommended: MECH 306.
MECH 340 Mechanical Engineer Design 3.0 SP
Recommended: MECH 311 with a grade of C– or higher, MATH 100, MECH 100L, MECH 210. Recommended: MECH 320, MFGT 160.
MECH 342 Energy Systems 4.0 FA
Prerequisites: MECH 318.
Mechanical Engineering Courses Offerings

Please see the section on “Course Description Symbols and Terms” in the University Catalog for an explanation of course description terminology and symbols, the course numbering system, and course credit units. All courses are lecture and discussion and employ letter grading unless otherwise stated. Some prerequisites may be waived with faculty permission. Many syllabi are available on the Chico Web.

**MECH 100 Graphics I**

Corequisites: MECH 100L.

Introduction to engineering graphics. Orthographic projection, auxiliary views, isometric views, dimensioning, tolerancing, drawing standards, working drawings, free-hand sketching, solid modeling. Special fee required; see the Class Schedule.

**MECH 100L Graphics I Laboratory**

Corequisites: MECH 100.

Introduction to solid modeling using a parametric, feature-based application software, SolidWorks. Solid modeling of parts and assemblies, detail and assembly drawings. 3.0 hours laboratory.

**MECH 140 Introduction to Engineering Design**

3.0 Fa/Spr

An introduction to the art and science of engineering design. Techniques for encouraging creativity in design. Use of a computer to control devices. Projects requiring design, construction, and testing of devices, including a computer-controlled electromechanical system. 2.0 hours discussion, 2.0 hours activity. Special fee required; see the Class Schedule.

**MECH 142 How Things Work**

3.0 Inquire

Prerequisites: General Education math course (Area A4).

This course seeks to enhance the students’ interest in and understanding of physical science and technology by motivating the students to discover the science and engineering design in ordinary devices encountered in their daily lives. (This course cannot be taken as an engineering elective.) 2.0 hours discussion, 2.0 hours activity.

**MECH 198 Special Topic**

1.0–3.0 Inquire

Special topic generally offered one time only. Different sections may have different topics. See the Class Schedule for specific topic being offered. This course may be repeated for a maximum of 21 units to be counted toward the major. 3.0 hours activity.

**MECH 200 Graphics II**

2.0 Fa/Spr

Drawing standards, geometric dimensioning and tolerancing, working drawings, product data management, intermediate solid modeling, introduction to Rapid Prototyping and specialized graphic applications. 1.0 hours activity. Special fee required; see the Class Schedule.

**MECH 210 Materials Science and Engineering**

3.0 Fa/Spr

Prerequisites: PHYS 204A; CHEM 111.

Processing, structure, properties, and performance of engineering materials. Applied knowledge of material properties as engineering design parameters. Advanced manufacturing processes, including microfabrication. 1.0 hours discussion, 2.0 hours activity. 3.0 hours laboratory. Special fee required; see the Class Schedule. CAN ENGR 4.

**MECH 298 Special Topic**

1.0–3.0 Inquire

Prerequisites: To be established when course is formulated. Special topic generally offered one time only. Different sections may have different topics. See the Class Schedule for specific topic being offered. This course may be repeated for a maximum of 21 units to be counted toward the major.

**MECH 306 Equation Solving Techniques**

4.0 Fall

Prerequisites: MATH 260. Recommended: PHYS 204A.

Numerical analysis, analytical methods, and equation solving techniques for mechanical engineering design. Structured problem formulation, parametric studies, introduction to programming concepts, and optimization for design. 3.0 hours discussion, 2.0 hours activity. Special fee required; see the Class Schedule.

**MECH 308 Finite Element Analysis**

3.0 Spring

Prerequisites: CIVL 311 with a grade of C– or higher, MECH 306. Recommended: MECH 210, PHYS 204C.

Development of finite element formulation from fundamental governing engineering equations. Coverage includes areas ranging from elasticity, vibration, and heat transfer to acoustics and composites. 2.0 hours discussion, 2.0 hours activity. Special fee required; see the Class Schedule.

**MECH 320 Dynamics**

3.0 Fa/Spr

Prerequisites: CIVL 211 with a grade of C– or higher, MATH 260. Kinematics and dynamics of mechanical systems composed of rigid bodies. Moments and products of inertia, forces of interaction, inertia forces and torques. Equations of motion of non-planar systems.
MECH 332 Thermodynamics 3.0 Fa/Spr
Prerequisites: PHYS 204A. Recommended: PHYS 204C. Properties of substances, ideal gas equation of state, heat and work, first and second laws of thermodynamics, steady-state analysis of closed and open systems, entropy, gas and vapor power cycles, introduction to renewable energy sources.

MECH 338 Heat Transfer 4.0 Spring
Prerequisites: CIVL 321, MECH 332. Recommended: MECH 306. Conduction, convection, and radiation heat transfer; steady-state and transient analysis methods; numerical methods applied to conduction heat transfer; design of finned arrays, systems for electronics cooling, heat exchangers, and solar collectors. 3.0 hours discussion, 2.0 hours activity.

MECH 340 Mechanical Engineering Design 3.0 Spring
Prerequisites: CIVL 331 with a grade of C– or higher, MECH 100, MECH 100L, MECH 210. Recommended: MECH 320, MFGT 160. Design and performance of machine components and systems subjected to both steady and variable loading conditions. Introduction to failure theories, reliability, use of codes and standards, and standard design practices. 2.0 hours discussion, 2.0 hours activity.

MECH 389 Industrial Internship 3.0 Fa/Spr
Prerequisites: Approval of faculty internship coordinator prior to off-campus assignment. Engineering experience in an industrial setting. Minimum duration of 400 hours of work under the direct supervision of an on-site engineering supervisor. On completion of the internship, a written report prepared under the direction of a faculty member is required. May be taken only once for credit. You may take this course more than once for a maximum of 15.0 units. Credit/no credit grading only.

MECH 398 Special Topic 1.0–3.0 Inquire
Prerequisites: To be established when course is formulated. Special topic generally offered one time only. Different sections may have different topics. See the Class Schedule for specific topic being offered. This course may be repeated for a maximum of 21 units to be counted toward the major.

MECH 399 Special Problems 1.0–3.0 Inquire
Prerequisites: Approval of supervising faculty member. This is an independent study of special problems offered for 1.0–3.0 units. See the department office for information on registering. You may take this course more than once for a maximum of 6.0 units. Credit/no credit grading only.

MECH 410 Advanced Materials Science and Engineering 3.0 Inquire

MECH 412 Fracture Mechanics 3.0 Inquire

MECH 414 Material Processing in Manufacturing 3.0 Inquire
Prerequisites: MECH 308, MECH 338, MFGT 160. Mechanics and analysis of processing parameters for metal forming, cutting, joining, and casting processes; polymer extrusion, injection, and molding processes; composite pultrusion, filament winding, vacuum bagging, and autoclave processes. Computer simulation for improvement of processes. 2.0 hours discussion, 2.0 hours activity.

MECH 418 Polymer Engineering 3.0 Inquire
Prerequisites: MATH 260, MECH 210. Major topics include polymer structure and synthesis, polymerization mechanisms, crystallinity, viscoelastic behavior in manufacturing processes and in service, deformation mechanisms, manufacture, and design with polymers. 2.0 hours discussion, 2.0 hours activity.

MECH 422 Dynamics of Machinery 3.0 Inquire

MECH 424 Mechanical Vibrations 3.0 Inquire
Prerequisites: MECH 320. Free and forced vibrations of lumped parameter systems, transient vibrations, systems with several degrees-of-freedom.

MECH 426 Rotor Dynamics 3.0 Inquire
Prerequisites: MECA 380, MECH 320. Dynamics of distributed masses on a flexible rotor, including modal analysis of free and forced vibration, balancing, support-bearing dynamics, rotor rub and similar phenomena. Diagnosis of rotor malfunctions with vibration measurement and analysis.

MECH 432 Energy Systems 4.0 Fall
Prerequisites: MECH 332. Thermodynamics of power cycles, refrigeration, air-conditioning, and combustion processes; analysis, design, and testing of systems involving both conventional and renewable energy sources for power generation, heating, and cooling applications. 3.0 hours discussion, 3.0 hours laboratory.

MECH 434 Compressible Flow 3.0 Inquire

MECH 435 Low-Speed Aerodynamics 3.0 Inquire

MECH 436 Air Pollution Control 3.0 Inquire
Prerequisites: CIVL 321 (or faculty permission), CHEM 111; either CHEM 331 or MECH 332. Recommended: CIVL 302, MECH 306. Analysis and design of components and systems for gaseous and particulate pollution control; gas separation by absorption, adsorption, condensation, and incineration; particulate separation by gravitysettlers, cyclones, electrostatic precipitators, fabric filters, and scrubbers; air pollution legislation and regulation.

MECH 439 Building Energy Analysis and Design 3.0 Inquire

MECH 440A Mechanical Engineering Design Project I 3.0 Fall
Prerequisites: ENGL 130 (or its equivalent) with a grade of C– or higher, MECH 200, MECH 340, MFGT 160. Recommended: CIVL 302, MECA 380, MECH 308, MECH 336. System design methods applied to mechanical systems. Group design projects. Consideration of the manufacturing cost, and environmental and social impact. Oral and written presentation of results. Initial design of the capstone design project to be continued in MECH 440B. 2.0 hours discussion, 3.0 hours laboratory. This is a writing proficiency, WP, course; a grade of C– or better certifies writing proficiency for majors.

MECH 440B Mechanical Engineering Design Project II 2.0 Spring
Prerequisites: MECH 440A. Recommended: CIVL 302, MECA 380, MECH 308, MECH 336. Continuation of the capstone design project from MECH 440A. Implementation of the capstone design project, including fabrication, testing, and evaluation of a working prototype. Must be taken the semester immediately following MECH 440A. 4.0 hours activity.

MECH 440H Mechanical Engineering Design Project I—Honors 3.0 Inquire
Prerequisites: ENGL 130 (or its equivalent) with a grade of C– or higher, MECH 340, MFGT 160, acceptance into the Honors in the Major program. Recommended: CIVL 302, MECA 380, MECH 308, MECH 336. System design methods applied to mechanical systems. Group design projects. Consideration of the manufacturing cost, and environmental and social impact. Oral and written presentations of results. Initial design of the Honors/capstone design project to be continued in MECH 440B. 2.0 hours discussion, 3.0 hours laboratory. This is a writing proficiency, WP, course; a grade of C– or better certifies writing proficiency for majors.

MECH 498 Special Topic 1.0–3.0 Inquire
Prerequisites: To be established when course is formulated. Special topic generally offered one time only. Different sections may have different topics. See the Class Schedule for specific topic being offered. This course may be repeated for a maximum of 21 units to be counted toward the major.

MECH 499 Special Problems 1.0–3.0 Fa/Spr
Prerequisites: Approval of supervising faculty member. This course is an independent study of special problems offered for 1.0–3.0 units. See the department office for information on registering. You may take this course more than once for a maximum of 6.0 units. Credit/no credit grading only.
Mechatronic Engineering is a new discipline that combines many of the skills of a mechanical engineer with those of a computer engineer and an electrical engineer. The mechatronic engineering graduate is prepared to design "intelligent" products such as "jitter-free" camcorders, active vehicle suspension systems that adjust to road conditions, anti-lock braking systems, and systems in EECE 315, EECE 343, and EECE 344. In the final senior project MECH 440A-Mechatronic Engineering Design Project I, MECA 440A-Mechatronic Engineering Design Project II, and MECH 440B-Mechatronic Engineering Design Project III, students are expected to exercise what they learned throughout the preceding design courses in a final project that includes assembly and testing, as well as the more global aspects of design including product realization, economic factors, environmental issues, and social impact. Together, these experiences prepare graduates to be successful practitioners with an awareness of the multitude of issues involved.

The Bachelor of Science in Mechatronic Engineering

Mechatronic Engineering Program Educational Objectives

The program's educational objectives are best framed in terms of goals for its graduates. Mechatronic engineering graduates will:

- Be effective interdisciplinary engineers and problem solvers.
- Be well educated in the basic engineering sciences and fundamentals of mechanical, electrical, and computer engineering.
- Be able to use engineering tools that will enhance their productivity.
- Be able to design, analyze, and test "intelligent" products and processes that incorporate suitable computers, sensors, and actuators.
- Be effective oral, written, and graphical communicators.
- Be able to function effectively as members of multi-disciplinary teams.
- Have an appreciation for the individual, society, and human heritage, and be aware of the impact of their designs on human-kind and the environment.
- Be prepared for a variety of engineering careers, graduate studies, and continuing education.

Mechatronic Engineering Program Requirements

The program structure for mechatronic engineers is integrated throughout the curriculum. The courses which include design experiences are:

EECE 144—Logic Design Fundamentals
EECE 221—Processor Architecture and Assembly Language Programming
EECE 315—Electronics I
EECE 344—Digital Systems Design
EECE 343—Computer Interface Circuits
MECA 440A—Mechatronic Engineering Design Project I
MECA 440B—Mechatronic Engineering Design Project II
MECH 340—Mechanical Engineering Design

At the freshman level, logic networks are designed in EECE 144. At the sophomore level, software design experience teaches students to think logically in developing efficient, structured computer programs in EECE 221. At the junior level, there is an opportunity to learn about safety, failure, reliability, codes and standards, and economic considerations, while carrying out detailed design of mechanical components in MECH 340, and electrical circuits and systems in EECE 315, EECE 343, and EECE 344. In the final senior project (MECA 440A and MECA 440B), students are expected to exercise what they learned throughout the preceding design courses in a final project that includes assembly and testing, as well as the more global aspects of design including product realization, economic factors, environmental issues, and social impact. Together, these experiences prepare graduates to be successful practitioners with an awareness of the multitude of issues involved.

The Bachelor of Science in Mechatronic Engineering

Total Course Requirements for the Bachelor's Degree: 132 units

See "Requirements for the Bachelor's Degree" in the University Catalog for complete details on general degree requirements. A minimum of 40 units, including those required for the major, must be upper division.

A suggested Major Academic Plan (MAP) has been prepared to help students meet all graduation requirements within four years. Please request a plan from your major advisor or view it and other current advising information on the CSU, Chico Web.

General Education Requirement

Mechatronic Engineering is a major with modifications to the University's General Education Requirements. The following courses, together with the approved General Education courses required for the Mechatronic Engineering major marked with an * below, fulfill the General Education Requirement.

1. Select two courses, one from each of the Core Areas A1 and A2.
2. Select one course from Breadth Area B2.
3. Select one course from Breadth Area C1 or C2 or C3.

MECH 499H Honors Project 3.0 Inquire
Prerequisites: Completion of 12 units of upper-division MECH courses, faculty permission.
Open by invitation to MECH majors who have a GPA among the top 5% of MECH students based upon courses taken at CSU, Chico. This is an "Honors in the Major" course; a grade of B or better in 6 units of MECH 499H certifies the designation of "Honors in the Major" to be printed on the transcript and the diploma. If taken twice, prerequisite to the second semester is a grade of B or better in the first semester. Each 3-unit course will require both formal written and oral presentations. You may take this course more than once for a maximum of 6.0 units.

MECH 508 Advanced Finite Element Analysis 3.0 Inquire
Prerequisites: MECH 308.
Finite-element methods in the analysis and optimal design of mechanical structures, machine components, and distributed systems. 3.0 hours clinical.

MECH 520 Advanced Dynamics 3.0 Inquire
Prerequisites: MECH 320.
Formulation of equations of motion of mechanical systems using Kane's dynamical equations. Holonomic and non-holonomic systems. Linearization and numerical solution of equations of motion.

MECH 531 Advanced Fluid Dynamics 3.0 Inquire
Prerequisites: CIVL 321, MECH 306.
Advanced analysis of fluid flow in engineering processes; application of Navier-Stokes equations to laminar and turbulent flows, with introduction to computational fluid dynamics (CFD); selected design applications, such as pipe systems, lubrication, aerodynamics, turbomachinery, multiphase flow, and flow measurement. 3.0 hours clinical.

MECH 534 Advanced Compressible Flow 3.0 Inquire
Prerequisites: MECH 434.
Multidimensional compressible flow; perturbation methods; hodograph plane and method of characteristics; shock wave analysis and design of nozzles and surfaces. 3.0 hours clinical.

MECH 538 Advanced Heat Transfer 3.0 Inquire
Prerequisites: MECH 338.
Application of thermal energy and mass diffusion equations to complex heat and mass transfer processes; variable property conduction, numerical methods, boiling and condensation, spectral analysis of thermal radiation, multi-mode problems, compact heat exchangers, gas absorption and adsorption, thermoelectric and heat pipe applications. 3.0 hours clinical.

MECH 679 Independent Study 1.0–3.0 Inquire
Prerequisites: Approval of supervising faculty member.
This course is a graduate-level independent study offered for 1.0–3.0 units. You may take this course more than once for a maximum of 6.0 units.

MECH 698 Advanced Topic 1.0–3.0 Inquire
Prerequisites: To be established when course is formulated.
This course is for special topics offered for 1.0–3.0 units. Typically the topic is offered on a one-time-only basis and may vary from term to term and be different for different sections. See the Class Schedule for the specific topic being offered. You may take this course more than once for a maximum of 3.0 units.

MECH 699 Master's Project 1.0–6.0 Inquire
Prerequisites: Approval of supervising faculty member.
Independent study leading to a Master's Thesis of a special problem approved by student's graduate advisory committee. See the department office for registration procedure. You may take this course more than once for a maximum of 6.0 units. Credit/no credit grading only.

MECH 699T Master's Thesis 1.0–6.0 Inquire
Prerequisites: Approval of supervising faculty member.
Independent study leading to a Master’s Thesis of a special problem approved by student's graduate advisory committee. See the department office for registration procedure. You may take this course more than once for a maximum of 6.0 units.

• A faculty that provides superior teaching and mentoring both in and out of the classroom
• A faculty whose focus is undergraduate education
• Class sizes that encourage student participation
• Project experiences that build on fundamentals and develop team skills
• Facilities and equipment that are readily accessible
• An environment that is conducive to learning and encourages students from different genders and backgrounds.

We are committed to offer a broad undergraduate experience that will promote professional growth and prepare students for a variety of engineering careers, graduate studies, and continuing education.
4. Select one course from Breadth Area D1 or D2 or D3.
5. Upper-division theme modification has been approved for this major. See “General Education” in the University Catalog for specifics on how to apply this modification.

Cultural Diversity Requirement: 6 units
Complete two Cultural Diversity courses, one Ethnic and one Non-Western. (See the “Bachelor's Degree Requirements” section.) Both courses must also satisfy one of the General Education Requirements in order for 132 units to fulfill all requirements for the Mechatronic Engineering degree.

American Institutions Requirement: 6 units
This requirement is normally fulfilled by completing HIST 130 and POLS 155. For other alternatives, see the “Bachelor's Degree Requirements” section.

Course Requirements for the Major: 105 units
The following courses, or their approved transfer equivalents, are required of all candidates for this degree.

Lower-Division Requirements: 53 units
17 courses required:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL 211 Statics</td>
<td>3.0 FS</td>
<td>Prerequisites: MATH 121 and PHYS 204A; CIVL 110 (may be taken concurrently)</td>
</tr>
<tr>
<td>or MECH 100 and MECH 100L (may be taken concurrently).</td>
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</tr>
<tr>
<td>CHEM 111 General Chemistry</td>
<td>4.0 FS</td>
<td>Prerequisites: Second-year high school algebra; one year high school chemistry.</td>
</tr>
<tr>
<td>(One year of high school physics and one year of high school mathematics past Algebra II are recommended.)</td>
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</tr>
<tr>
<td>EECE 135 Algorithms &amp; Progs for Engrs</td>
<td>3.0 FS</td>
<td>Prerequisites: MATH 120 is recommended.</td>
</tr>
<tr>
<td>EECE 144 Logic Design Fundamentals</td>
<td>4.0 FS</td>
<td>Prerequisites: Recommended: EECE 101, MECH 100.</td>
</tr>
<tr>
<td>EECE 211 Linear Circuits I</td>
<td>3.0 FS</td>
<td>Prerequisites: MATH 121, PHYS 204B.</td>
</tr>
<tr>
<td>EECE 211L Linear Circuits I Activity Corequisites: EECE 211.</td>
<td>1.0 FS</td>
<td></td>
</tr>
<tr>
<td>EECE 221 Processor Arch/Assembly Lang</td>
<td>3.0 FS</td>
<td>Prerequisites: Either CSCI 111 or EECE 135.</td>
</tr>
<tr>
<td>MATH 120 Analytic Geometry and Calculus</td>
<td>4.0 FS*</td>
<td>Prerequisites: Completion of ELM requirement; both MATH 118 and MATH 119 (or high school equivalent); a score that meets department guidelines on a department administered calculus readiness exam.</td>
</tr>
<tr>
<td>Prerequisites must be completed with a C- or higher.</td>
<td></td>
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</tr>
<tr>
<td>MATH 121 Analytic Geometry and Calculus</td>
<td>4.0 FS</td>
<td>Prerequisites: MATH 120.</td>
</tr>
<tr>
<td>Prerequisites must be completed with a C- or higher.</td>
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</tr>
<tr>
<td>MATH 260 Elem Differential Equations</td>
<td>4.0 FS</td>
<td>Prerequisites: MATH 121.</td>
</tr>
<tr>
<td>Prerequisites must be completed with a C- or higher.</td>
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</tr>
<tr>
<td>MECH 100 Graphics I</td>
<td>1.0 FS</td>
<td>Corequisites: MECH 100.</td>
</tr>
<tr>
<td>MECH 100L Graphics I Laboratory</td>
<td>1.0 FS</td>
<td>Corequisites: MECH 100.</td>
</tr>
<tr>
<td>MECH 210 Materials Science/Engineering</td>
<td>3.0 FS</td>
<td>Prerequisites: PHYS 204A or CHEM 111.</td>
</tr>
<tr>
<td>MFGT 160 Manufacturing Processes</td>
<td>3.0 FS</td>
<td>Prerequisites: High school physics or faculty permission. Concurrent enrollment in or prior completion of MATH 121 (second semester of calculus) or equivalent.</td>
</tr>
<tr>
<td>PHYS 204A Mechanics</td>
<td>4.0 FS*</td>
<td>Prerequisites: High school physics or faculty permission. Concurrent enrollment in or prior completion of MATH 121 (second semester of calculus) or equivalent.</td>
</tr>
<tr>
<td>PHYS 204B Electricity and Magnetism</td>
<td>4.0 FS</td>
<td>Prerequisites: MATH 121, PHYS 204A with a grade of C- or higher.</td>
</tr>
<tr>
<td>PHYS 204C Heat/Wave Motion/Sound/Light</td>
<td>4.0 FS</td>
<td>Prerequisites: MATH 121, PHYS 204A with a grade of C- or higher.</td>
</tr>
</tbody>
</table>

Upper-Division Requirements: 52 units
14 courses required:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL 302 Engineering Econ &amp; Statistics</td>
<td>3.0 FS</td>
<td>Prerequisites: MATH 121, junior standing.</td>
</tr>
<tr>
<td>CIVL 311 Strength of Materials</td>
<td>4.0 FS</td>
<td>Prerequisites: CIVL 211 with a grade of C- or higher; CIVL 110 or MECH 100 and MECH 100L; MATH 260 and MECH 210 (may be taken concurrently).</td>
</tr>
<tr>
<td>CIVL 495 Lifelong Development Engineers</td>
<td>3.0 FS</td>
<td>Prerequisites: ENGL 130 or equivalent; senior standing.</td>
</tr>
<tr>
<td>EECE 311 Linear Circuits II</td>
<td>4.0 FS</td>
<td>Prerequisites: EECE 211, MATH 260 (may be taken concurrently).</td>
</tr>
<tr>
<td>EECE 315 Electronics I</td>
<td>4.0 FS</td>
<td>Prerequisites: EECE 211, EECE 211L.</td>
</tr>
<tr>
<td>Corequisites: EECE 311, MATH 260.</td>
<td></td>
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</tr>
<tr>
<td>EECE 343 Computer Interface Circuits</td>
<td>4.0 FS</td>
<td>Prerequisites: EECE 144, EECE 315.</td>
</tr>
<tr>
<td>EECE 344 Digital Systems Design</td>
<td>4.0 FS</td>
<td>Prerequisites: EECE 144, EECE 221; either EECE 110 or EECE 211 and EECE 211L.</td>
</tr>
<tr>
<td>MECA 380 Measurements &amp; Instrumentation</td>
<td>3.0 SP</td>
<td>Prerequisites: EECE 211, EECE 211L; either ECE 135 or MECH 306.</td>
</tr>
</tbody>
</table>

MEGA 482 Control System Design 4.0 FA
Prerequisites: ECE 211, MATH 260. Recommended: MECA 380, MECH 320; either EECE 135 or MECH 310.
This course is also offered as ECE 482.

MEGA 486 Motion and Machine Automation 4.0 FA
Prerequisites: EECE 211L, MECH 340. Corequisites: ECE 482 or MECA 482.

MEGA 440A Mechatronic Engr Design Proj | 3.0 FA WP
Prerequisites: ENGL 130 (or its equivalent) with a grade of C- or higher, EECE 344, MECH 340, MFGT 160. Recommended: CIVL 302, MECA 380.

MEGA 440B Mechatronic Engr Des Proj II 2.0 SP
Prerequisites: MEGA 440A. Recommended: CIVL 302, MECA 380.

MECH 320 Dynamics 3.0 FS
Prerequisites: CIVL 211 with a grade of C- or higher, MATH 260.

MECH 340 Mechanical Engineer Design 3.0 SP
Prerequisites: CIVL 311 with a grade of C- or higher, MECH 100, MECH 100L, MECH 110. Recommended: MECH 320, MFGT 160.

1 course selected from:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>EECE 316 Electronics II</td>
<td>4.0 SP</td>
<td>Prerequisites: EECE 315.</td>
</tr>
<tr>
<td>EECE 437 Real-Time Embedded Systems</td>
<td>4.0 SP</td>
<td>Prerequisites: CSCI 111; either EECE 221 or CSCI 221.</td>
</tr>
<tr>
<td>Recommended: CSCI 112; either CSCI 320 or EECE 320.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EECE 481 Electromechanical Conversion</td>
<td>4.0 FA</td>
<td>Prerequisites: EECE 211.</td>
</tr>
<tr>
<td>MEGA 580 Data Acquisition</td>
<td>4.0 Inq</td>
<td>Prerequisites: MEGA 380.</td>
</tr>
</tbody>
</table>

Grading Requirement:
All courses taken to fulfill major course requirements must be taken for a letter grade except those courses specified by the department as Credit/No Credit grading only.

Advising Requirement:
Advising is strongly recommended for all majors in this degree program. Consult your undergraduate advisor for specific information.

Honors in the Major
Honors in the Major is a program of independent work in your major. It involves six units of honors course work completed over two semesters. The Honors in the Major program allows you to work closely with a faculty mentor in your area of interest on an original performance or research project. This year-long collaboration allows you to work in your field at a professional level and culminates in a public presentation of your work. Students sometimes take their projects beyond the University for submission in professional journals, presentation at conferences, or competition in shows. Such experience is valuable for graduate school and later professional life. Your Honors work will be recognized at your graduation, on your permanent transcript, and on your diploma. It is often accompanied by letters of commendation from your mentor in the department or the department chair.

Some common features of Honors in the Major program are:
1. You must take 6 units of Honors in the Major course work. At least 3 of these units are independent study (399, 499W) as specified by your department.
2. You must complete each class with a minimum grade of B.
3. You must have completed 9 units of upper-division course work or 21 overall units in your major before you can be admitted to Honors in the Major. Check the requirements for your major carefully, as there may be specific courses that must be included in these units.
4. Your cumulative GPA should be at least 3.5 or within the top 5% of majors in your department.
5. Your GPA in your major should be at least 3.5 or within the top 5% of majors in your department.
6. Most students apply for or are invited to participate in Honors in the Major during the second semester of their junior year. Then they complete the 6 units of course work over the two semesters of their senior year.
7. Your honors work culminates with a public presentation of your honors project.

While Honors in the Major is part of the Honors Program, each department administers its own program. Please contact your major department or major advisor to apply.

The Faculty

Mechatronic Engineering
Adel Ghandakly, 2005, Chair, Professor, PhD, U Calgary.
Chen H. Hsu, 1982, Professor, PhD, Iowa State U.
Gregory A. Kallio, 1988, Chair, Professor, PhD, Washington State U.
Ronald L. Roth, 1986, Professor, MD, PhD, Stanford U.
Jimmy Tan-atichat, 1987, Professor, PhD, Illinois Inst of Tech.
Ramesh M. Varahamurti, 1984, Professor, PhD, Washington State U.
Michael G. Ward, 1988, Associate Dean, Professor, PE, PhD, Stanford U.
Dale Word, 2002, Assist Professor, MS, CSU Chico.
MECA 198 Special Topic
Special topic generally offered one time only. Different sections may have different topics. See the Class Schedule for specific topic being offered. This course may be repeated for a maximum of 21 units to be counted toward the major. 2.0 hours activity.

MECA 298 Special Topic
Prerequisites: To be established when course is formulated. Special topic generally offered one time only. Different sections may have different topics. See the Class Schedule for specific topic being offered. This course may be repeated for a maximum of 21 units to be counted toward the major.

MECA 380 Measurements and Instrumentation
Prerequisites: ECE 211, ECE 211L, either ECE 135 or MECH 306. Recommended: CIVL 302. Measurement of steady-state and dynamic phenomena using common laboratory instruments. Calibration of instruments, dynamic response of instruments, and the treatment of data. 2.0 hours discussion, 3.0 hours laboratory. Special fee required; see the Class Schedule.

MECA 389 Industrial Internship
Prerequisites: Approval of faculty internship coordinator prior to off-campus assignment. Engineering experience in an industrial setting. Minimum duration of 400 hours of work under the direct supervision of an on-site engineering supervisor. On completion of the internship, a written report prepared under the direction of a faculty member is required. May be taken only once for credit. You may take this course more than once for a maximum of 15.0 units. Credit/no credit grading only.

MECA 398 Special Topic
Prerequisites: To be established when course is formulated. Special topic generally offered one time only. Different sections may have different topics. See the Class Schedule for specific topic being offered. This course may be repeated for a maximum of 21 units to be counted toward the major.

MECA 399 Special Problems
Prerequisites: Approval of supervising faculty member. This course is an independent study of special problems offered for 1.0–3.0 units. See the department office for information on registering. You may take this course more than once for a maximum of 6.0 units. Credit/no credit grading only.

MECA 440A Mechatronic Engineering Design Project I
Prerequisites: ENGL 130 (or its equivalent) with a grade of C– or higher, ECE 344, MECH 340, MFGE 160. Recommended: CIVL 302, MECA 180. System design methodologies applied to mechatronic systems. Group design projects. Consideration of the manufacturing cost, and environmental and social impact. Oral and written presentation of results. Initial design of the capstone design project to be continued in MECA 440B. 2.0 hours discussion, 3.0 hours laboratory. This is a writing proficiency, WP, course; a grade of C– or better certifies writing proficiency for majors.

MECA 440B Mechatronic Engineering Design Project II
Prerequisites: MECA 440A. Recommended: CIVL 302, MECA 380. Continuation of the capstone design project from MECA 440A. Implementation of the capstone design project, including fabrication, testing, and evaluation of a working prototype. Must be taken the semester immediately following MECA 440A. 4.0 hours activity.

MECA 440H Mechatronic Engineering Design Project I—Honors
Prerequisites: ENGL 130 (or its equivalent) with a grade of C– or higher, ECE 344, MECH 340, MFGE 160, acceptance into the Honors in the Major program. Recommended: CIVL 302, MECA 380. System design methodologies applied to mechatronic systems. Group design projects. Consideration of the manufacturing cost, and environmental and social impact. Oral and written presentation of results. Initial design of the Honors/capstone design project to be continued in MECA 440B. 2.0 hours discussion, 3.0 hours laboratory. This is a writing proficiency, WP, course; a grade of C– or better certifies writing proficiency for majors.

MECA 482 Control System Design
Prerequisites: EECE 211, MATH 260. Recommended: MECA 380, MECH 320; either EECE 135 or MECH 306. Modeling and simulation of dynamic system performance. Control system design for continuous systems using both analog and digital control techniques. 3.0 hours lecture, 2.0 hours activity. Special fee required; see the Class Schedule. This course is also offered as ECE 482.

MECA 486 Motion and Machine Automation
Prerequisites: EECE 211L, MECH 340. Corequisites: EECA 482 or MECA 482. Machine automation techniques in electrical circuits, precision mechanics, control systems, and programming. Motor sizing, gearing, couplings, ground loops, effective use of step motors, servo control loops, regeneration, networking, I/O, power supplies, vibration and resonance, noise, and tolerancing, limits and tolerances, and troubleshooting. Labs simulate application concepts such as point-to-point coordinated moves, registration, following, camming, and CAD-to-Motion by combining various motor technologies with various mechanical drive types. 2.0 hours discussion, 4.0 hours activity.

MECA 498 Special Topic
Prerequisites: To be established when course is formulated. Special topic generally offered one time only. Different sections may have different topics. See the Class Schedule for the specific topic being offered. This course may be repeated for a maximum of 21 units to be counted toward the major.

MECA 499 Special Problems
Prerequisites: Approval of supervising faculty member. Independent study of a special problem. See the department office for registration procedure. You may take this course more than once for a maximum of 6.0 units. Credit/no credit grading only.

MECA 499H Honors Project
Prerequisites: Completion of 12 units of upper-division EECE, MECH, or MECA courses, faculty permission. Open by invitation to MECA majors who have a GPA among the top 5% of students at the university. Minor in the Major is required. Each individual 3.0 units project must be completed. 3.0–6.0 units. Required: 1.0–3.0 units. See the department office for information on registering. You may take this course more than once for a maximum of 6.0 units.

MECA 580 Data Acquisition: Concepts and Applications
Prerequisites: MECA 380. General considerations in data acquisition systems, analog preprocessing, sampling, and quantization (A/D and D/A conversions), the computer as a data acquisition controller, input-output techniques, time-series analysis and signal reconstruction. 2.0 hours discussion, 4.0 hours activity. Formerly MECA 580.

MECA 582 Advanced Control System Design
Prerequisites: MECA 482 or EECE 482. Computer-aided design and analysis of automatic control techniques to mechanical engineering problems. Single and multivariable feedback systems. Controllability, observability, and state estimation. Simulation of control systems. 3.0 hours clinical. Formerly MECA 582.

MECA 697 Independent Study
Prerequisites: Approval of supervising faculty member. Independent study of a special problem. See the department office for registration procedure. You may take this course more than once for a maximum of 6.0 units. Credit/no credit grading only.

MECA 698 Advanced Topic
Prerequisites: Specific to the topic being offered. Advanced topic generally offered one time only. Different sections may have different topics. See the Class Schedule for specific topics being offered. You may take this course more than once for a maximum of 3.0 units.

MECA 699P Master’s Project
Prerequisites: Approval of supervising faculty member. Independent study leading to a Master’s Thesis of a special problem approved by the student’s graduate advisory committee. See the department office for registration procedures. You may take this course more than once for a maximum of 6.0 units.