Program

BS in Manufacturing Technology
Minor in Manufacturing

This multidisciplinary program is designed to prepare men and women to meet the growing need for manufacturing professionals. The curriculum emphasizes organized laboratory experiences to provide students with a working knowledge of traditional and computer-aided design and production tools.

The program is built on a foundation of lower-division math, science, economics, and manufacturing concepts. Upper-division manufacturing technology (MFGT) classes integrate that foundation into a unified body of knowledge on the management of materials, processes, costs, and personnel. In addition to this core curriculum, the program currently offers a range of laboratory courses in three high demand areas: Computer-Integrated Manufacturing, Metals Processing, Polymer/Plastics Processing.

The Minor in Manufacturing is specially designed to complement business and engineering majors. The MFGT Degree Program is professionally accredited by the National Association of Industrial Technology (NAIT) and the Foundry Educational Foundation (FEF).

Career Outlook

Job opportunities are available throughout the manufacturing sector—in both large and small, local and national companies involved in the full range of operations—from research and development through mass production. Although the program is designed to educate students as technical managers, graduates are employed in numerous capacities. The median starting salary for 2005–2006 MFGT graduates was $54,500 per year for these entry-level positions:

Manufacturing/Operations Manager
Maintenance/Testing Manager
Manufacturing/Applications/Project Engineer
Technical Sales/Purchasing Representative
Production Planner/Supervisor
Quality Engineer/ Specialist
Certified Technician/Practitioner
Tooling/Process Designer
Technical Instructor/Trainer

Industrial Support

Many organizations actively support the program by sponsoring projects, funding research, donating equipment and materials, and hiring graduates. The program’s partners are exemplified by the Manufacturing Technology Advisory Board. Its members provide direction and guidance from their vantage point as senior managers in the manufacturing industry.

Student Organizations

Active participation in student chapters of professional organizations develops well-rounded individuals with leadership, managerial, social, and technical skills. Current on-campus student chapters include:

Society of Manufacturing Engineers (SME)
Society of Plastics Engineers (SPE)

These student organizations arrange guest speakers, field trips, social activities, and sponsor professional certification exams. Manufacturing students also compete and excel in regional design and fabrication competitions.

Scholarships

In addition to university-wide scholarships, manufacturing students are eligible for twelve to fifteen MFGT-specific scholarships each year. Individual awards range from $100 to $1,000 and are based on academic performance/improvement, participation in activities, leadership qualities, and/or financial need.

Internships

On-campus work experience is available through a limited number of part-time production jobs and sponsored projects in the program’s labs. Many students also take advantage of cooperative education/internship opportunities available through the University’s Office of Experiential Education. These are full-time, semester and/or summer positions with well-known companies. Participants gain professional experience, earn salaries of $2,500–$3,500 per month, as well as receiving upper-division course credit.
Manufacturing Technology Program Goals

The program’s objectives are best defined in terms of the following attributes of its graduates:

- First and foremost, CSU, Chico manufacturing technology graduates understand how products are designed, produced, and tested.
- They have experience with contemporary manufacturing processes, particularly for parts consisting of metals and polymers.
- They understand the fundamental behavior of materials and the testing techniques used to determine material properties.
- They integrate project management, quality assurance methods, and the economic issues involved in manufacturing.
- They are familiar with contemporary computer applications and process automation, including the use of sensors, actuators, and controllers to automate machines and processes.
- They are practiced at communicating their ideas in oral, written, and graphical form.
- They function effectively as team members.
- They develop an appreciation for the individual, society, and human heritage, and they are aware of the impact of their products on the environment.

Total Course Requirements for the Bachelor's Degree: 128 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

Manufacturing Technology is a major with modifications to the University's General Education Requirements. The following courses, together with the approved General Education courses for the manufacturing technology major (marked with an * below), fulfill the General Education Requirement.

1. Select three courses, one from each of Core Areas A1, A2, and A3.
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 E.
5. Upper-division theme modification has been approved for this major. See the General education chapter 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 128 units to fulfill all requirements for the Manufacturing Technology 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 a C– or better 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: 98 units

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

Lower-Division Requirements: 53 units

18 courses required:

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<tr>
<th>Course</th>
<th>Units</th>
<th>Type</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>ACCT 201</td>
<td>3.0</td>
<td>FS</td>
<td>Intro to Financial Accounting</td>
</tr>
<tr>
<td>CHEM 107</td>
<td>4.0</td>
<td>FS*</td>
<td>Gen Chem for Applied Sciences</td>
</tr>
<tr>
<td>CHEM 108</td>
<td>4.0</td>
<td>FS</td>
<td>Organic Chem for Applied Sci</td>
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<tr>
<td>CHEM 107 of CHEM 111</td>
<td></td>
<td></td>
<td>or equivalent</td>
</tr>
<tr>
<td>ECON 102</td>
<td>3.0</td>
<td>FS</td>
<td>Principles of Macro Analysis</td>
</tr>
<tr>
<td>ECON 103</td>
<td>3.0</td>
<td>FS</td>
<td>Principles of Micro Analysis</td>
</tr>
<tr>
<td>ECE 110</td>
<td>3.0</td>
<td>FS</td>
<td>Basic Electricity/Instruments</td>
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</table>

None. This course is not intended for engineering majors.

MATH 105 Statistics 3.0 FS

Prerequisites: Completion of ELM requirement.

MATH 119 Precalculus Mathematics 4.0 FS

Prerequisites: Completion of ELM requirement, and either 1/2 year of high school trigonometry or MATH 118.

MECH 100 Graphics I 1.0 FS

Corequisites: MECH 100L.

MECH 100L Graphics I Laboratory 1.0 FS

MECH 200 Graphics II 2.0 FS

MECH 200L Basic Electricity/Instruments 3.0 FS

MFGT 160 Manufacturing Processes 3.0 FS

MFGT 201 Graphics Applications for Mfg 2.0 SP

Prerequisites: MATH 105, MATH 200.

MFGT 216 Introduction to Plastics 3.0 FA

Prerequisites: CHEM 107 or CHEM 111. Recommended: CHEM 108, MATH 105.

MFGT 218 Polymer Materials 3.0 SP

Prerequisites: MFGT 216. Recommended: CHEM 108.

MFGT 260 Material Removal 3.0 FA

Prerequisites: MFGT 160. Recommended: PHYS 202A.

PHYS 202A General Physics 4.0 FS*

Prerequisites: High school physics or faculty permission. High school trigonometry and second-year high school algebra or equivalent (MATH 051 and MATH 118 at CSU, Chico).

PHYS 202B General Physics 4.0 FS

Prerequisites: PHYS 202A.

Upper-Division Requirements: 39 units

12 courses required:

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<tr>
<th>Course</th>
<th>Units</th>
<th>Type</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>MFGT 310</td>
<td>3.0</td>
<td>FA</td>
<td>Materials &amp; Quality Testing</td>
</tr>
<tr>
<td>Prerequisites: MFGT 160, MFGT 216, Recommended: MATH 119, PHYS 202A.</td>
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<tr>
<td>MFGT 350</td>
<td>3.0</td>
<td>SP</td>
<td>Industrial Supervision</td>
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<tr>
<td>Prerequisites: Junior standing.</td>
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<tr>
<td>MFGT 352</td>
<td>4.0</td>
<td>SP WP</td>
<td>Industrial Safety Management</td>
</tr>
<tr>
<td>Prerequisites: ENGL 130 or its equivalent with a grade of C– or higher, junior standing.</td>
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<tr>
<td>MFGT 360</td>
<td>4.0</td>
<td>FA</td>
<td>Computer-Aided Manufact CAM</td>
</tr>
<tr>
<td>MFGT 360L</td>
<td>3.0</td>
<td>FA</td>
<td>Manufacturing CAM</td>
</tr>
<tr>
<td>MFGT 386</td>
<td>3.0</td>
<td>FS</td>
<td>Manufact Automation Systems</td>
</tr>
<tr>
<td>Prerequisites: EECE 110, MATH 360.</td>
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<tr>
<td>MFGT 451</td>
<td>3.0</td>
<td>FS</td>
<td>Quality Management</td>
</tr>
<tr>
<td>Prerequisites: SCMS 306 or faculty permission. This course is also offered as SCMS 451.</td>
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<tr>
<td>MFGT 454</td>
<td>2.0</td>
<td>FS</td>
<td>Advanced Laboratory Practices</td>
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<tr>
<td>Prerequisites: Senior standing, faculty permission.</td>
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<tr>
<td>MFGT 458</td>
<td>3.0</td>
<td>FA</td>
<td>Project Management</td>
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<tr>
<td>Prerequisites: Senior standing.</td>
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<tr>
<td>MFGT 464</td>
<td>3.0</td>
<td>SP</td>
<td>Fluid Metallurgy</td>
</tr>
<tr>
<td>MFGT 468</td>
<td>4.0</td>
<td>SP</td>
<td>Capstone: Manufact Tooling</td>
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<tr>
<td>Prerequisites: MFGT 218, MFGT 360; MFGT 458 or MGMT 444.</td>
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<tr>
<td>MFGT 490</td>
<td>1.0</td>
<td>SP</td>
<td>Manufact Fundamentals &amp; Pract</td>
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<tr>
<td>Prerequisites: Graduation in MFGT expected within 12 months.</td>
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<tr>
<td>SCMS 306</td>
<td>3.0</td>
<td>FS</td>
<td>Operations Management</td>
</tr>
<tr>
<td>Prerequisites: Business Administration or Business Information Systems status required for business majors. Completion of General Education Breadth Area A4 requirements required for all majors.</td>
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1 course selected from:

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<tr>
<th>Course</th>
<th>Units</th>
<th>Type</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>SCMS 412</td>
<td>3.0</td>
<td>FS</td>
<td>Prod Plan &amp; Inventory Control</td>
</tr>
<tr>
<td>Prerequisites: SCMS 306.</td>
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<tr>
<td>SCMS 443</td>
<td>3.0</td>
<td>FS</td>
<td>Prod Mgmt &amp; Control Systems</td>
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<tr>
<td>Prerequisites: SCMS 306.</td>
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</table>

Major Elective Requirement: 6 units

2 courses selected from:

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<tr>
<th>Course</th>
<th>Units</th>
<th>Type</th>
<th>Prerequisites</th>
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</thead>
<tbody>
<tr>
<td>MFGT 362</td>
<td>3.0</td>
<td>Inq</td>
<td>Material Joining</td>
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<tr>
<td>Prerequisites: MFGT 160.</td>
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<tr>
<td>MFGT 370</td>
<td>3.0</td>
<td>Inq</td>
<td>Plastics Processing &amp; Manufact</td>
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<tr>
<td>Prerequisites: MFGT 216.</td>
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</table>
MFGT 372 Composites Material/Processing 3.0 Inq
Prerequisites: MFGT 218.
MFGT 389 Directed Manufacturing Exp 3.0 FS
Prerequisites: Approval of faculty internship coordinator prior to off-campus assignment.
MFGT 472 Advanced Composites 3.0 Inq
Prerequisites: MFGT 218.
MFGT 474 Polymer Flow Analysis 3.0 Inq
Prerequisites: MFGT 218.
MFGT 476 Polymer Design and Tooling 3.0 Inq
Prerequisites: MFGT 218, MFGT 360. Recommended: MFGT 474.
MFGT 478 Elastomers 3.0 Inq
Prerequisites: MFGT 218.

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

The Minor in Manufacturing

Course Requirements for the Minor: 23–26 units
The following courses, or their approved transfer equivalents, are required of all candidates for this minor.

3 courses required:
MFGT 160 Manufacturing Processes 3.0 FS
MFGT 451 Quality Management 3.0 FS
Prerequisites: SCMS 306 or faculty permission. This course is also offered as SCMS 451.
SCMS 306 Operations Management 3.0 FS
Prerequisites: Business Administration or Business Information Systems status required for business majors. Completion of General Education Breadth Area A4 requirements required for all majors.

1-2 courses selected from:
CIVL 110 Graphics for Civil Engineers 2.0 FS
Prerequisites: High school trigonometry and algebra.

OR
CMGT 110 Construction Graphics 3.0 FS
OR (take both of the following courses)
MECH 100 Graphics I 1.0 FS
Corequisites: MECH 100L.
MECH 100L Graphics I Laboratory 1.0 FS
Corequisites: MECH 100L.

1 course selected from:
MATH 107 Finite Math for Business 3.0 FS
Prerequisites: Completion of ELM requirement.
MATH 119 Precalculus Mathematics 4.0 FS
Prerequisites: Completion of ELM requirement, and either 1/2 year of high school trigonometry or MATH 118.
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.

1 course selected from:
BADM 103 Statistics of Business & Econ 3.0 FS
Prerequisites: For Business Administration majors: MATH 107. For others: Completion of General Education Breadth Area A4 requirement.
CIVL 302 Engineering Econ & Statistics 3.0 FS
Prerequisites: MATH 121, junior standing.
MATH 105 Statistics 3.0 FS
Prerequisites: Completion of ELM requirement.
MATH 108 Statistics of Business & Econ 3.0 FS
Prerequisites: For business administration students: MATH 107. For other students: completion of General Education Breadth Area A4 requirement.

1 course selected from:
CMGT 457 Project Control and Scheduling 3.0 SP
Prerequisites: CMGT 450.
MECH 440A Mech Engr Design Proj I 3.0 FA WP
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 338.
MECA 440A Mechatronic Engr Design Proj I 3.0 FA WP
Prerequisites: ENGL 130 (or its equivalent) with a grade of C– or higher, EEE 344, MECH 340, MFGT 160. Recommended: CIVL 302, MECA 380.
MFGT 350 Industrial Supervision 3.0 SP
Prerequisites: Junior standing.
MGMT 303 Survey of Management 3.0 FS
SCMS 443 Prod Mgmt & Control Systems 3.0 FS
Prerequisites: SCMS 306.

1-2 courses selected from:
MFGT 216 Introduction to Plastics 3.0 FA
Prerequisites: CHEM 107 or CHEM 111. Recommended: CHEM 108, MATH 105.
OR
MFGT 260 Material Removal 3.0 FA
Prerequisites: MFGT 160. Recommended: PHYS 202A.
OR (take both of the following courses)
MECH 200 Graphics II 2.0 FS
Prerequisites: MECH 100 and MECH 100L.
MFGT 201 Graphics Applications for Mfg 2.0 SP
Prerequisites: MATH 105, MECH 200.

The Faculty

Manufacturing Technology
Scott Brogden, 2002, Lecturer A, BS, CSU Chico.
Leonard W. Fallscheer, 1979, Assoc Professor, MA, CSU Chico.
Joseph P. Greene, 1998, Professor, PhD, U Michigan.
Daren Otten, 2005, Lecturer A, MS, CSU Chico.
Dirk Vanderloop, 1997, Lecturer C, DPA, USC.

Emeritus Faculty
Robert Wesley Donoho, 1970, Professor Emeritus, PhD, Kansas State U.
Ronald Walter Hall, 1968, Professor Emeritus, EdD, Arizona State U.
R. Lee Koenig, 1986, Professor Emeritus, MA, San Jose State U.
William J. McNelley, 1969, Professor Emeritus, PhD, Oregon State U.
George P. Waldheim, 1985, Professor Emeritus, EdD, SUNY Buffalo.
Jesse D. Wallace, 1958, Professor Emeritus, MA, U Missouri.

Manufacturing Technology 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.

MFGT 160 Manufacturing Processes 3.0 Fa/Spr
This course is designed to familiarize the student with the basic concepts of manufacturing engineering, i.e., an understanding of the common manufacturing materials and processes, and the knowledge to solve manufacturing problems. 2.0 hours discussion, 3.0 hours laboratory. Special fee required; see the Class Schedule.

MFGT 198 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. 1.0 hours activity.

MFGT 201 Graphics Applications for Manufacturing 2.0 Spring
Advanced solid modeling techniques, quality assurance (inspection, metrology, coordinate measuring machines, statistical process control, six sigma), and design considerations (design for manufacturing, rapid prototyping). 1.0 hours discussion, 3.0 hours laboratory.

MFGT 216 Introduction to Plastics 3.0 Fall
Prerequisites: CHEM 107 or CHEM 111. Recommended: CHEM 108, MATH 105.
Survey of polymer chemistry, mechanical properties, and industrial processing of thermoplastics. 2.0 hours discussion, 3.0 hours laboratory. Special fee required; see the Class Schedule.

MFGT 218 Polymer Materials 3.0 Spring
Prerequisites: MFGT 216. Recommended: CHEM 108.
Study of engineering thermoplastic materials, thermoplastic blends, elastomers, and thermoset composites. Investigation of injection molding, and structural foam. Introduction to plastic flow analysis. 2.0 hours discussion, 3.0 hours laboratory. Special fee required; see the Class Schedule.

MFGT 260 Material Removal 3.0 Spring
Prerequisites: MFGT 160. Recommended: PHYS 202A.
A study of the industrial applications of material-removal technology. Emphasis will be placed on the management of the application of the technology. Units involving the physics of metal-cutting, cutting-tool materials and geometry, conventional and semi-automatic machine tools, and cost-estimating are included. 2.0 hours discussion, 3.0 hours laboratory. Special fee required; see the Class Schedule.
MFGT 298 Special Topic 1.0 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.

MFGT 310 Materials and Quality Testing 3.0 Fall
Prerequisites: MFGT 310, MFGT 216. Recommended: MATH 119, PHYS 202A. Study of the manufacturing, processing, applications, and testing of common industrial materials, including metals, polymers, ceramics, and composites. 2.0 hours discussion, 3.0 hours laboratory. Special fee required; see the Class Schedule.

MFGT 350 Industrial Supervision 3.0 Spring
Prerequisites: Junior standing.
Current supervisory and managerial procedures used in industry for supervisors, managers, field and sales representatives, and inspectors.

MFGT 352 Industrial Safety Management 4.0 Spring
Prerequisites: ENGL 130 or its equivalent with a grade of C– or higher, junior standing. A study of effective industrial safety management practice and the philosophy and principles of industrial accident prevention. Coverage includes examination of current industrial safety practices and federal and state programs designed to improve safety in an industrial environment. Introduction to effective industrial safety documentation—gathering, organizing, and reporting industrial safety data. This is a writing proficiency, WP, course; a grade of C– or better certifies writing proficiency for majors.

MFGT 360 Computer-Aided Manufacturing (CAM) 4.0 Fall
Prerequisites: MFGT 201, MFGT 260.
A study of the concepts involved in programming computer numerically controlled (CNC) machines. This course includes integration of computer-aided manufacturing (CAD/CAM). 3.0 hours discussion, 3.0 hours laboratory. Special fee required; see the Class Schedule.

MFGT 362 Material Joining 3.0 Inquire
Prerequisites: MFGT 160.
A study of the industrial applications of material-joining technology directed toward managing the applications of the processes. Units involving adhesive bonding, mechanical fasteners, and welding are included, along with metallurgy, specimen testing, and cost estimating. 2.0 hours discussion, 3.0 hours laboratory. Special fee required; see the Class Schedule.

MFGT 370 Plastics Processing and Manufacturing 3.0 Inquire
Prerequisites: MFGT 216.
Study of plastics manufacturing, plastics processing, plastics compounding, plastic flow analysis, gating systems, tool design, data acquisition, experimental design, tooling, and processing equipment for injection molding, extrusion, compression molding, thermforming, and rotational molding. 2.0 hours discussion, 3.0 hours laboratory.

MFGT 372 Composite Materials & Processing 3.0 Inquire
Prerequisites: MFGT 218.
Study of thermoplastic and thermostet composites and materials and processing with an emphasis on epoxy, polyester, and polyurethane reinforced with glass, kevlar, carbon fiber, and cored materials. Introduction to composites tool design and processing, including compression molding, resin transfer molding, hand lay-up, and vacuum assisted molding. 2.0 hours discussion, 3.0 hours laboratory.

MFGT 386 Manufacturing Automation Systems 3.0 Spring
Prerequisites: EECE 110, MFGT 360.
A study of the programming and function of industrial robots and other automation systems used in modern manufacturing environments. Concepts include end effector design, material movement, storage and retrieval systems, programmable logic controllers, and vision systems. Lecture, demonstrations, and laboratory exercises designed to promote understanding of manufacturing automation. 2.0 hours discussion, 3.0 hours laboratory. Special fee required; see the Class Schedule.

MFGT 389 Industrial Internship 3.0 Fa/Spr
Prerequisites: Approval of faculty internship coordinator prior to off-campus assignment.
Manufacturing experience in an industrial setting which provides an opportunity to apply academic learning to professional practice. Minimum duration of 400 hours of work under the direct supervision of an on-site manufacturing 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 toward the major. You may take this course more than once for a maximum of 15.0 units. Credit/no credit grading only.

MFGT 398 Special Topic 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 the specific topic being offered. Normally taught by professionals from the field. This course may be repeated for a maximum of 21 units to be counted toward the major.

MFGT 399 Special Problems 1.0–3.0 Inquire
Prerequisites: Approval of supervising faculty member. Independent study of a special problem. See 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.

MFGT 451 Quality Management 3.0 Fa/Spr
Prerequisites: SCMS 306 or faculty permission.
The study and application of the quality management process in both the manufacturing and service sectors of the economy. Topics include process analysis and improvement, statistical process control, cost of quality, quality measurement, and quality in the global marketplace. 3.0 hours discussion, 1.0 hours activity. This course is also offered as SCMS 451.

MFGT 454 Advanced Laboratory Practices 2.0 Fa/Spr
Prerequisites: Senior standing, faculty permission.
Provides qualified students an opportunity to do individual special interest study and practice toward gaining proficiencies in the student’s area of specialization.

MFGT 458 Project Management 3.0 Fall
Prerequisites: Senior standing.
This course familiarizes students with techniques for managing technical projects while they design, plan, and implement a manufacturing project through the mock-up stage. Students work in groups on projects of mutual interest to gain experience in planning and updating schedules. Students learn to define requirements, estimate and manage resources, and structure decisions and trade-offs. Emphasis is placed on group dynamics in communication and problem solving. 2.0 hours discussion, 2.0 hours activity.

MFGT 464 Fluid Metallurgy 3.0 Spring
Prerequisites: MFGT 310, MFGT 360.
A study of metal-casting technologies directed at the management of a metal-casting plant. 2.0 hours discussion, 3.0 hours laboratory. Special fee required; see the Class Schedule.

MFGT 468 Capstone: Manufacturing Tooling 4.0 Spring
Prerequisites: MFGT 218, MFGT 360, MFGT 458 or MGMT 444.
Students design, fabricate, test, and evaluate production tooling used in the manufacture or assembly of metal or plastic parts in their capstone projects. 2.0 hours discussion, 6.0 hours laboratory. Special fee required; see the Class Schedule.

MFGT 472 Advanced Composites 3.0 Inquire
Prerequisites: MFGT 218.
Investigation of aerospace composite materials and processing, including vinyl esters, polyesters, epoxy, PEEK, kevlar, metal matrix composites, ceramic composites, composite tooling and design. 2.0 hours discussion, 3.0 hours laboratory. Special fee required; see the Class Schedule.

MFGT 474 Polymer Flow Analysis 3.0 Inquire
Prerequisites: MFGT 218.
Investigation of flow simulation for injection molding using C-Mold and Moldflow CAE computer programs, and an introduction to finite element methods and analysis principles. 2.0 hours discussion, 3.0 hours laboratory.

MFGT 476 Polymer Design and Tooling 3.0 Inquire
Prerequisites: MFGT 218, MFGT 360. Recommended: MFGT 474.
Investigation of polymer design principles and tooling standards for injection molding, blow molding, and extrusion. Development and construction of injection molding and extrusion dies using computer-aided design programs and metal removal machines. 2.0 hours discussion, 3.0 hours laboratory. Special fee required; see the Class Schedule.

MFGT 478 Elastomers 3.0 Inquire
Prerequisites: MFGT 218.
Study of rubber-like materials, including thermoplastic rubbers, thermostet rubbers, silicones, thermoplastic elastomers, and urethanes. Investigation of tooling and processing of elastomers. 2.0 hours discussion, 3.0 hours laboratory.

MFGT 490 Manufacturing Fundamentals and Practice 1.0 Spring
Prerequisites: Graduation in MFGT expected within 12 months.
Review of manufacturing technology fundamentals and foundation for professional practice. Current topics in manufacturing. Preparation and encouragement for the Fundamentals of Manufacturing Examination. 2.0 hours activity. Credit/no credit grading only.
### MFGT 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 the specific topic being offered. This course is normally taught by professionals from the field. This course may be repeated for a maximum of 21 units to be counted toward the major.

### MFGT 499 Special Problems 1.0–3.0 Inquire
Prerequisites: Approval of supervising faculty member. Independent study of a special problem. See 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.

### MFGT 499H Honors Project 3.0 Inquire
Prerequisites: Completion of 12 units of upper-division MFGT courses, faculty permission. Open by invitation to MFGT majors who have a GPA among the top five percent of MFGT students, based on courses taken at CSU, Chico. This is an Honors in the Major course; a grade of B or better in 6 units of MFGT 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. 9.0 hours supervision. You may take this course more than once for a maximum of 6.0 units.

### MFGT 697 Independent Study 1.0–6.0 Inquire
Prerequisites: Approval from supervising faculty member. This 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.

### MFGT 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 a topic is offered on a one-time-only basis and topics vary from term to term and from section to section. See the Class Schedule for the specific topics being offered. 3.0 hours clinical. You may take this course more than once for a maximum of 3.0 units.

### MFGT 699P Master’s Project 1.0–3.0 Fa/Spr
Prerequisites: Approval from supervising faculty member. Independent study of a special problem approved by 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.

### MFGT 699T Master’s Thesis 1.0–6.0 Inquire
Prerequisites: Approval from 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.