# ADVANCED MANUFACTURING AND APPLIED ROBOTICS (AMAR)

See Course Description Symbols and Terms (https://catalog.csuchico.edu/academic-standards-policies/course-description-symbols-terms/) for an explanation of course description terminology and symbols, the course numbering system, and course credit units.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
<th>Typically Offered</th>
<th>Prerequisite</th>
<th>Grade Basis</th>
<th>Repeatability</th>
<th>Course Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMAR 160</td>
<td>Manufacturing Processes</td>
<td>3</td>
<td>Fall and spring</td>
<td>MATH 105 and MATH 119 or MATH 120, MECH 140 (may be taken concurrently).</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
<td>Upper Division</td>
</tr>
<tr>
<td>AMAR 198</td>
<td>Special Topic</td>
<td>1-3</td>
<td>Inquire at department</td>
<td>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 hour activity. (015894)</td>
<td>Graded</td>
<td>You may take this course more than once</td>
<td>Lower Division</td>
</tr>
<tr>
<td>AMAR 260</td>
<td>Applied Advanced Manufacturing</td>
<td>4</td>
<td>Spring only</td>
<td>MATH 105. Recommended: MATH 105. Industrial applications of subtractive and additive manufacturing. Traditional and advanced material removal techniques including the physics of metal-cutting, cutting-tool materials and geometry, conventional and semi-automatic machine tools, and electrical discharge machining (EDM). Additive manufacturing topics include 3D printing, rapid prototyping, and emerging additive manufacturing, processes and technologies. Also includes cost estimating and power management as applied to industrial scale manufacturing. 3 hours laboratory, 3 hours lecture. (005212)</td>
<td>Graded</td>
<td>You may take this course for a maximum of 4 units</td>
<td>Lower Division</td>
</tr>
<tr>
<td>AMAR 298</td>
<td>Special Topic</td>
<td>1</td>
<td>Inquire at department</td>
<td>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 hour discussion. (015850)</td>
<td>Graded</td>
<td>You may take this course more than once</td>
<td>Lower Division</td>
</tr>
<tr>
<td>AMAR 300</td>
<td>Applied Mathematics and Programming for Advanced Manufacturing</td>
<td>3</td>
<td>Fall only</td>
<td>MATH 105 and MATH 119 or MATH 120, MECH 140 (may be taken concurrently).</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
<td>Upper Division</td>
</tr>
<tr>
<td>AMAR 316</td>
<td>Introduction to Plastics</td>
<td>3</td>
<td>Fall only</td>
<td>CHEM 107 or CHEM 111, MECH 210 (may be taken concurrently).</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
<td>Upper Division</td>
</tr>
<tr>
<td>AMAR 318</td>
<td>Advanced Plastics &amp; Composites</td>
<td>3</td>
<td>Spring only</td>
<td>AMAR 160 (with a grade of C- or higher), MATH 119 or MATH 120, PHYS 202A or PHYS 204A. Recommended: MATH 105.</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
<td>Upper Division</td>
</tr>
<tr>
<td>AMAR 347</td>
<td>Sustainable Polymer Composites</td>
<td>3</td>
<td>Inquire at department</td>
<td>CHEM 107 or CHEM 111, MECH 210 (may be taken concurrently).</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
<td>Upper Division</td>
</tr>
</tbody>
</table>

**Notes:**
- Grade Basis: Graded
- Repeatability: You may take this course for a maximum number of units.
- Course Attributes: Upper Division

(005212) (021724) (022070) (022071) (022074)
AMAR 352W Industrial Management (W) 3 Units W, GW
Prerequisite: GE Written Communication (A2) requirement, junior standing.
Typically Offered: Fall only
A study of effective industrial safety and supervisory management practices used in the manufacturing industry. Supervisory and managerial procedures used in industry by supervisors, managers, field and sales representatives, and inspectors. Instruction in communication, training, organization, ethics, conflict management, safety practices, and OSHA standards. Instruction in effective technical safety documentation - gathering, organizing, and reporting industrial safety data. 3 hours discussion. (005670)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Writing Course; Graduation Writing Assessment

AMAR 360 Computer Integrated Manufacturing 4 Units
Prerequisite: AMAR 260, MECH 200.
Typically Offered: Fall only
A study of computer numerical control (CNC) machine tools used in the manufacture of engineered products. Integration of computer aided design and computer aided manufacturing (CAD/CAM) software. Course activities utilize industrial scale CNC machining centers and lathes. Advanced manufacturing topics such as toolpath optimization and factory floor integration are introduced. 3 hours laboratory, 3 hours lecture. (005278)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

AMAR 389 Directed Manufacturing Experience 1-3 Units
Prerequisite: Approval of faculty internship coordinator prior to off-campus assignment.
Typically Offered: Fall and spring
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 report prepared under the direction of a faculty member is required. This course is an elective for the BS in Advanced Manufacturing and Applied Robotics; a total of 3 units must be completed to receive elective credit. 3 hours supervision. (005294)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

AMAR 395 Manufacturing Laboratory Practice 1 Unit
Prerequisite: AMAR 160.
Typically Offered: Fall and spring
Provides additional time in the manufacturing laboratories for completion of manufacturing and engineering course-related projects and assignments. 2 hours activity. (020682)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 7 units
Course Attributes: Upper Division

AMAR 398 Special Topic 3 Units
Prerequisite: To be established when course is formulated.
Typically Offered: Inquire at department
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. 1 hour discussion. (005250)
Grade Basis: Graded
Repeatability: You may take this course more than once
Course Attributes: Upper Division

AMAR 399 Special Problems 1-3 Units
Prerequisite: Approval of supervising faculty member.
Typically Offered: Inquire at department
Independent study of a special problem. See department office for registration procedure. 3 hours supervision. (005251)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Upper Division

AMAR 420 Robotics for Advanced Manufacturing 4 Units
Prerequisite: EECE 344 or MECA 380.
Typically Offered: Fall only
An overview of robotics and its application to advanced manufacturing. Topics include vision, motion planning, mobile mechanisms, kinematics, dynamics, and sensors. Course activities will utilize industrial scale robots and associated hardware as well as modern simulation tools. This course will also introduce contemporary topics in robotics research and its application. 3 hours laboratory, 3 hours lecture. (022128)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

AMAR 440A Capstone Design I 3 Units W, GW
Prerequisite: GE Oral Communication (A1) requirement; GE Written Communication (A2) requirement; AMAR 360; AMAR 458 (may be taken concurrently). Recommended: MECA 380.
Typically Offered: Fall and spring
Design methods applied to manufacturing systems in group design projects. Project definition, planning, and management. Design for manufacture, cost considerations, budgets, and teamwork. Oral and written presentation of design results. Initial stage of the capstone project to be continued in AMAR 440B. 2 hours lecture, 3 hours supervision. (022124)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Writing Course; Graduation Writing Assessment

AMAR 440B Capstone Design II 3 Units
Prerequisite: AMAR 440AW.
Typically Offered: Fall and spring
Implementation of the capstone design project from AMAR 440AW including fabrication, testing, and evaluation of a working prototype. Impact of engineering solutions in global, economic, environmental, and societal context. Ethical and professional responsibilities in engineering including continuing self-education and career development. Must be taken the semester immediately following AMAR 440AW. 2 hours lecture, 2 hours supervision. (022125)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division
AMAR 451 Quality Management 3 Units
Prerequisite: OSCM 306 or faculty permission; MATH 105 or MATH 108 for Business majors only.
Typically Offered: Fall and spring
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 hours lecture. (005784)
Cross listing(s): OSCM 451
Grade Basis: Graded
Repeatability: You may take this course more than once
Course Attributes: Upper Division

AMAR 454 Advanced Laboratory Practices 2 Units
Prerequisite: Faculty permission.
Typically Offered: Fall and spring
Provides qualified students an opportunity to do individual special interest study and practice toward gaining proficiencies in the student’s area of specialization. 6 hours independent study. (005279)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Upper Division

AMAR 458 Project Management 3 Units
Prerequisite: Senior standing.
Typically Offered: Fall only
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. Discussion includes global project management and supply chain responsibility. Emphasis is placed on group dynamics in communication and problem solving. 3 hours lecture. (005291)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

AMAR 460 Robotic Manufacturing Systems 4 Units
Prerequisite: AMAR 420.
Typically Offered: Spring only
A continuation of robotics and its application to advanced manufacturing. Implementation of smart manufacturing systems on the factory floor. Practical automation workflows based on parametric modeling, scripting, simulation, and optimization. Course activities will utilize industrial scale robots and associated hardware. This course will also introduce contemporary topics in robotics research applied to machine learning and artificial intelligence. 3 hours laboratory, 3 hours lecture. (022129)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

AMAR 464 Fluid Metallurgy 3 Units
Prerequisite: AMAR 160.
Typically Offered: Inquire at department
The course provides students a comprehensive overview of the study of metal casting technology. Students learn about the properties of casting allows, casting processes, pattern design, pattern making, mold making, core design, core making, heat treating, finishing of castings, and sand testing. 3 hours laboratory, 2 hours lecture. (005209)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

AMAR 477 Nanoscale Device Manufacturing 3 Units
Prerequisite: EECE 315 or MECH 210.
Typically Offered: Spring only
This course introduces the manufacturing processes for various classes of nanoscale devices from logic/memory semiconductors to nano-electro-mechanical systems (NEMS). Study of processes including photore sist lithography, ingot growth, ion implantation, chemical vapor deposition, atomic layer deposition, and molecular beam epitaxy. Course covers the fundamental performance barriers for each material/device type and perform defect analyses to assess how defects either improve or degrade these materials. Also covered are financial aspects of nanoscale manufacturing including capital equipment costs, the financial history of these industries, return on investment, amortization, and case studies of both industry failures and successes. 3 hours lecture. (021768)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

AMAR 498 Advanced Topic 1-3 Units
Prerequisite: To be established when course is formulated.
Typically Offered: Inquire at department
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. 1 hour discussion. (005308)
Grade Basis: Graded
Repeatability: You may take this course more than once
Course Attributes: Upper Division

AMAR 499 Special Problems 1-3 Units
Prerequisite: Approval of supervising faculty member.
Typically Offered: Inquire at department
Independent study of a special problem. See department office for registration procedure. 9 hours supervision. (015852)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Upper Division