

ME 312: Manufacturing Engineering

<i>Course description:</i>	Traditional and advanced manufacturing processes for metals, plastics, and ceramics combined with laboratory practice.
<i>Number of credits:</i>	3
<i>Course Coordinator:</i>	A. Gozen
<i>Prerequisites by course:</i>	MSE 201; admitted to major in Mechanical Engineering
<i>Prerequisites by topic:</i>	<ol style="list-style-type: none">1. Equilibrium phase diagrams.2. Time-temperature transformation characteristics of plain carbon steels.3. Engineering stress, engineering strain, Hooke's law.4. Structure and properties of polymeric materials.
<i>Postrequisites:</i>	ME 474, ME 475
<i>Textbooks/other required materials:</i>	S. Kalpakjian and S. Schmid. <i>Manufacturing Engineering & Technology</i> . Pearson, 6/e. Bandyopadhyay, Amit, and Susmita Bose, eds. <i>Additive Manufacturing</i> . CRC press, 2015
<i>Course objectives:</i>	To identify, discuss, analyze the following manufacturing processes for engineering materials and the associated equipment: <ol style="list-style-type: none">1. Casting.2. Bulk deformation.3. Sheet metal forming.4. Machining.5. Manufacturing of polymers, metal-powders, composites, and ceramics.6. Additive manufacturing <p>Gaining practical experience in geometric dimensioning and tolerancing, traditional and automated machining, additive manufacturing, and plastic molding processes.</p>
<i>Topics covered:</i>	<ol style="list-style-type: none">1. Casting of metals and alloys.2. Rolling, forging, extrusion, and drawing.3. Cutting, bending, and drawing of sheet metal.4. Traditional, shear process machining.5. Nontraditional machining.6. Manufacturing of polymers and reinforced plastics.7. Processing of metal-powders and ceramics.8. Additive manufacturing methods involving polymers, metals and ceramics.

- Expected learning outcomes:* Upon successful completion of the course, the students will be able to:
1. Examine the design drawing of a component and describe a feasible sequence of manufacturing processes for production of the component.
 2. Distinguish between different types of casting and differentiate between their output product characteristics.
 3. Describe, in engineering sketch form, the bulk deformation processes of forging, rolling, extrusion, and drawing.
 4. Understand the theory and practice of various traditional and CNC-type machining operations and relate the common mechanisms of cutting tool wear to desirable cutting tool material properties.
 5. Identify specific polymer, ceramic, and composite processing methods based on material and component geometric properties.
 6. Understand the theory and practice of various additive manufacturing methods. Be able to compare them to conventional manufacturing methods and identify the cases where additive manufacturing is economically viable.
 7. Be able to utilize precision measurement devices: micrometer, digital calipers, basics of GD&T.
 8. Be proficient in executing the computer-aided design–computer-aided manufacturing (CAD-CAM) sequence.

Class schedule: Two 50-minute lectures per week

Laboratory schedule: One weekly three-hour session

Contribution to meeting the professional component: Engineering Topics

Relationship of course to student outcomes: Meets:

1. School of MME ME educational objectives: 1, 2
2. School of MME ME program outcomes: 1, 5
3. ABET EC2019, Criterion 3 program outcomes: 1, 5

Prepared by: Amy Johnson and A. Gozen

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POLICIES

A. Reasonable Accommodation (the nature of the particular course determines which one applies):

- Pullman Campus. Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center (Washington Building 217; 509-335-3417) to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center.
- WSU Online Course. Reasonable accommodations are available in online classes for students with a documented disability. All accommodations must be approved through your WSU Disability Services office. If you have a disability and need accommodations, we recommend you begin the process as soon as possible. For more information contact a Disability Specialist on your home campus: Pullman or WSU Online (<http://accesscenter.wsu.edu>), Spokane (<http://spokane.wsu.edu/students/current/studentaffairs/disability/>), Tri-Cities (<http://www.tricity.wsu.edu/disability>), Vancouver (<http://studentaffairs.vancouver.wsu.edu/student-resource-center/disability-services>).

B. Academic Integrity

WSU expects all students to behave in a manner consistent with its high standards of scholarship and conduct. Students are expected to uphold these standards both on and off campus and acknowledge the university's authority to take disciplinary action. The Standards of Conduct for Students can be

found at <http://conduct.wsu.edu>.

C. WSU Safety

WSU is committed to maintaining a safe environment for its faculty, staff, and students. Safety is the responsibility of every member of the campus community and individuals should know the appropriate actions to take when an emergency arises. In support of our commitment to the safety of the campus community the University has developed a Campus Safety Plan, <http://safetyplan.wsu.edu>. It is highly recommended that you visit this web site as well as the University emergency management web site at <http://oem.wsu.edu/> to become familiar with the information provided.