

ME240 Survey of Manufacturing Processes
Learning Objectives

1. Able to identify the influence of mechanical behavior of materials on casting, machining, forming, and joining operations.
2. Able to list how fracture and fatigue properties are affected by the presence of surface and bulk imperfections and crack which create stress concentrations; and that these properties can be greatly improved by appropriate processing. First, one aims to avoid defect and, when this is not possible, one designs the process so as to impose compressive residual stress. However, unbalanced residual stress can cause distortion.
3. Able to list the importance of homologous temperature; and that at high homologous temperature, the mobility of atoms or molecules lead to creep and to high strain-rate sensitive strength properties.
4. Able to list elementary concepts of tribology, and with the importance of adhesion, friction, wear and lubrication.
5. Realize that mechanical and physical properties of metals are important both in service and during manufacture, and that manufacturing processes must be designed so as to take the potentials and limitations of materials into account, while also ensuring that the desired service properties are obtained in the final product.
6. Recognize that the shape of parts is an important determinant of manufacturing processes and costs, as are dimensional tolerances and surface finish requirements. Able to list definitions of geometrical tolerancing, waviness, roughness heights, and lay.
7. Able to identify the process capabilities and limitations of various casting processes. Able to list remedies for defects in castings. Able to define castability of metals and factors that influence castability.
8. Able to identify the process capabilities and limitations of various forming processes such as forging, rolling, extrusion, and drawing. Be able to distinguish homogenous deformation and inhomogeneous deformation. Able to provide remedies for possible defects in metal formation processes. Able to list the factors that influence formability.

9. Able to identify the process capabilities and limitations of various machining processes. Able to identify conditions and provide remedies relating to poor tool life and poor machined product. Able to list the factors that influence machinability.
10. Able to identify the process capabilities and limitations of various joining processes such as mechanical, solid-liquid state, and liquid state joints. Able to provide remedies for defects in joints. Able to list the factors that influence weldability.