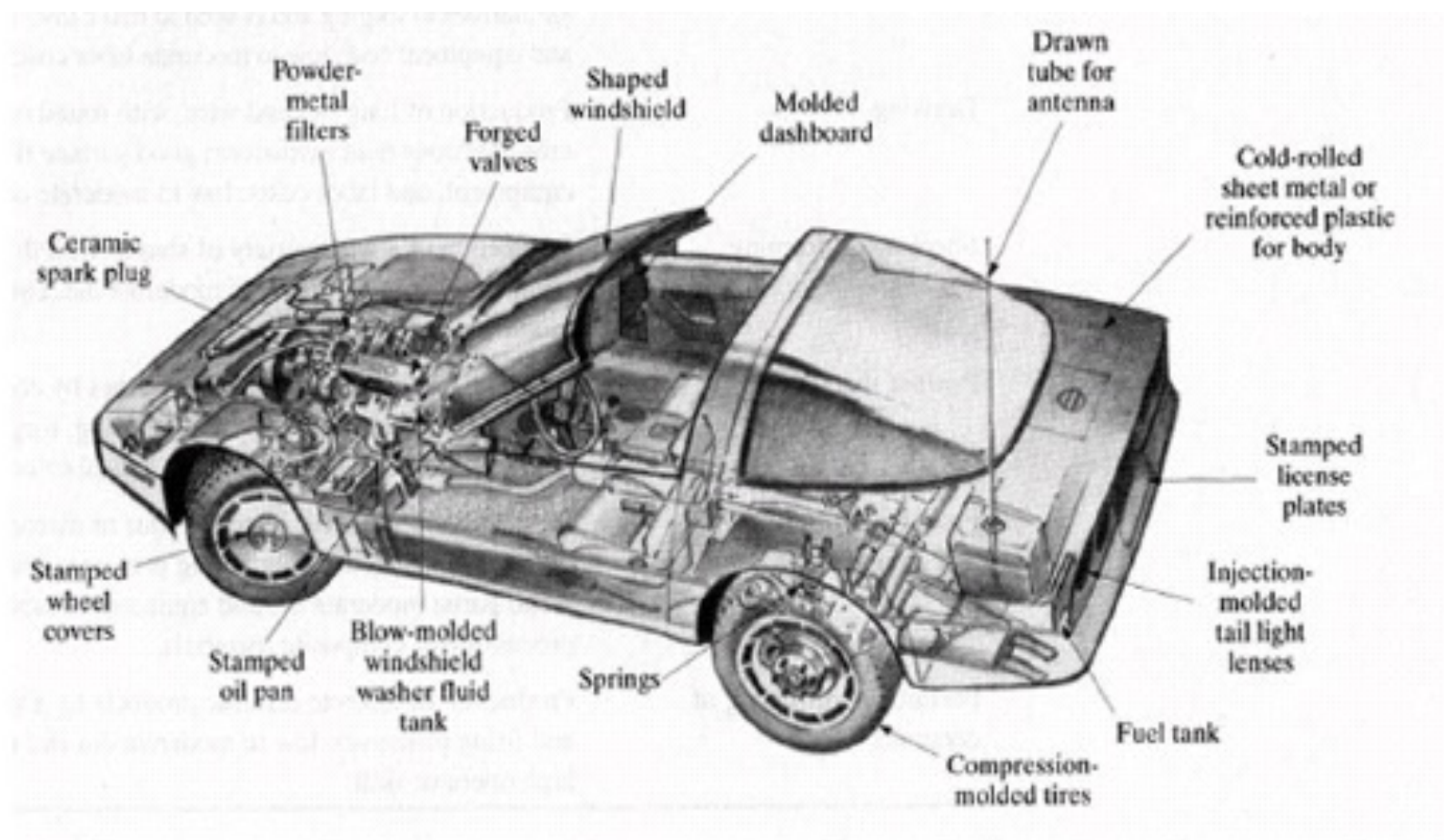


## BASIC MANUFACTURING PROCESSES 1



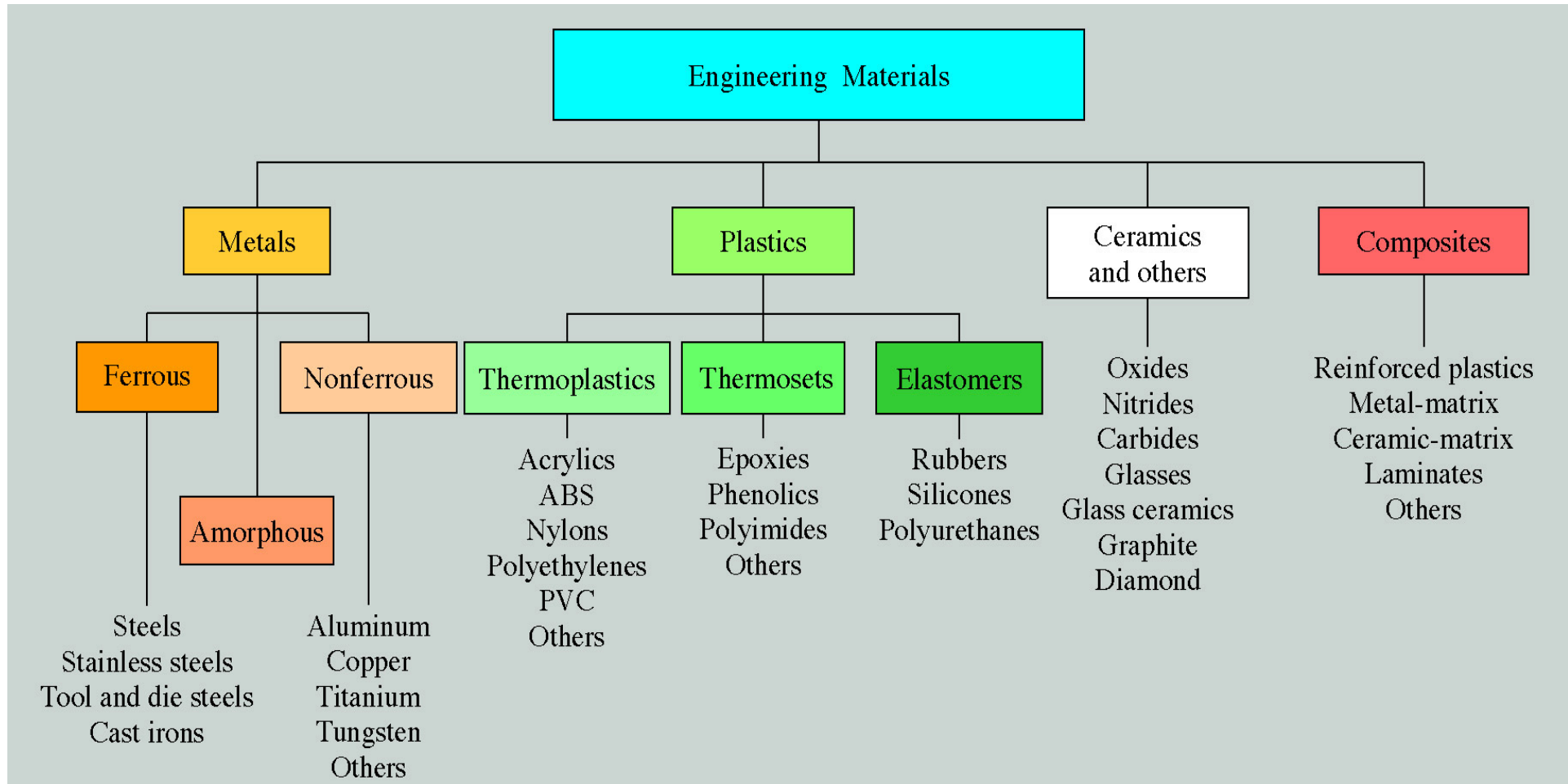
# Contents

- 1. Materials in manufacturing**
- 2. Manufacturing processes**

# 1. Materials in Manufacturing

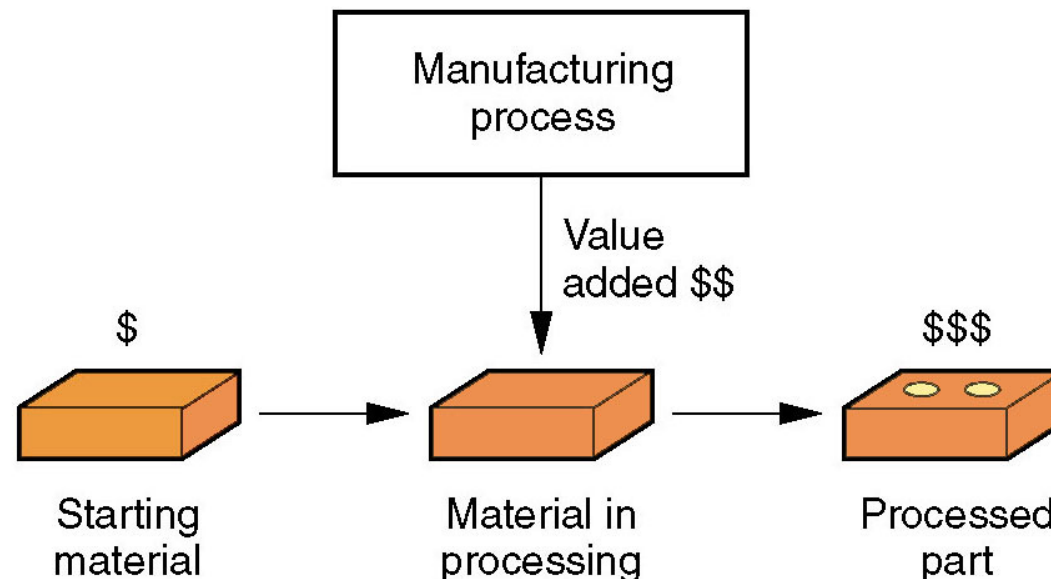
- Most engineering materials can be classified into one of three basic categories:
  1. Metals
  2. Ceramics
  3. Polymers
- Their chemistries are different, their mechanical and physical properties are dissimilar, and these differences affect the manufacturing processes that can be used to produce products from them

# Engineering Materials



# What is Manufacturing?

- Manufacturing as an economic process
  - **Manufacturing** is the **transformation** of materials into items of greater value by means of one or more processing and/or assembly operations
  - Manufacturing **adds value** to the material by changing its shape or properties, or by combining it with other materials that have been similarly altered



## 2. Manufacturing Processes

### Two basic types:

- I. **Processing operations** - transform a work material from one state of completion to a more advanced state
  - Operations that change the geometry, properties, or appearance of the starting material
- II. **Assembly operations** - join two or more components in order to create a new entity

# I. Processing Operations

- Alters a workpart's shape, physical properties, or appearance in order to add value to the material

Three categories of processing operations:

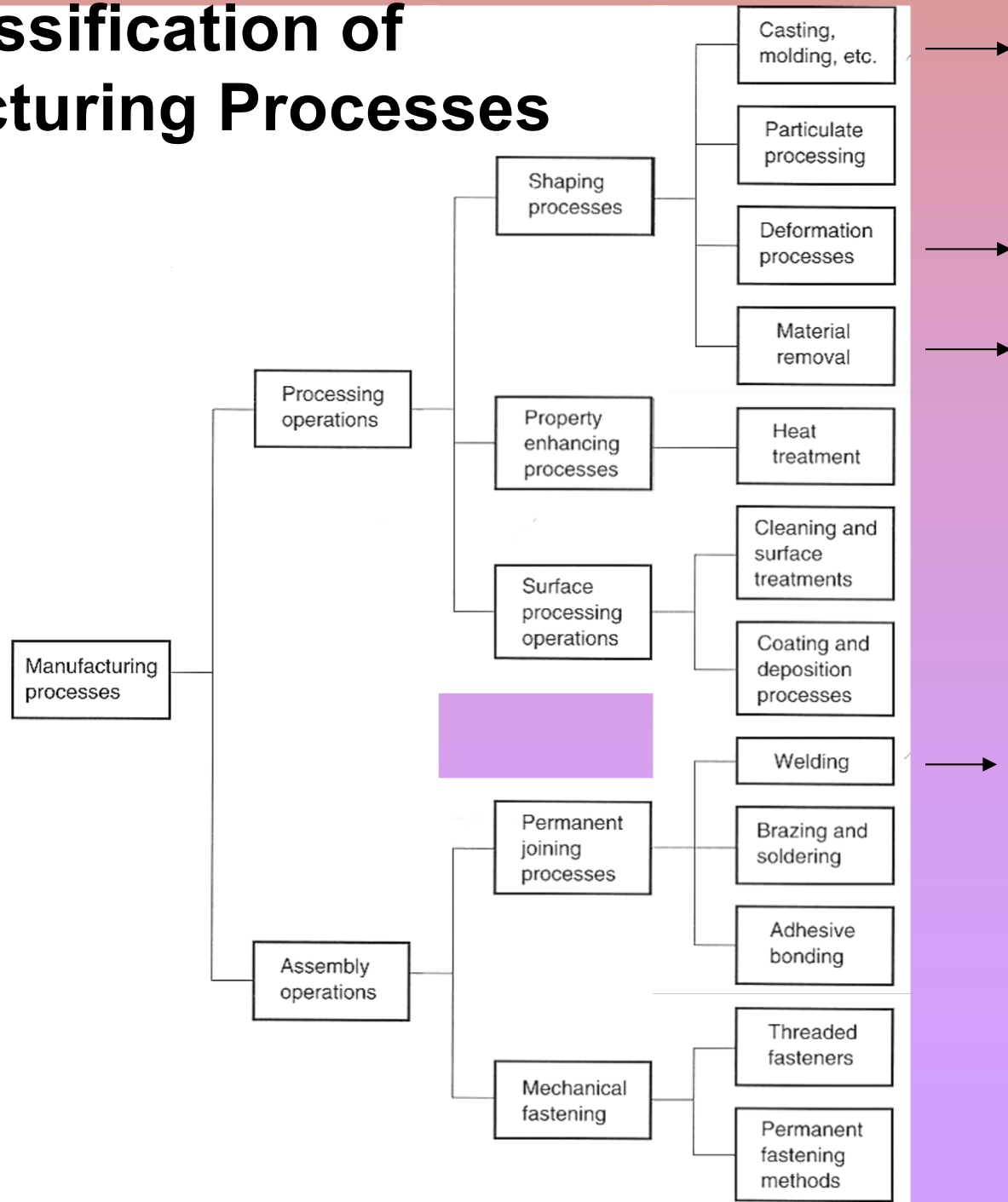
1. **Shaping operations** - alter the geometry of the starting work material
2. **Property-enhancing operations** - improve physical properties of the material without changing its shape
3. **Surface processing operations** - performed to clean, treat, coat, or deposit material onto the exterior surface of the work

# Shaping Operation – Four Categories UTM UNIVERSITI TEKNOLOGI MALAYSIA Transportation Research Alliance (TRA)

1. ***Solidification processes*** - starting material is a heated *liquid* or *semifluid* that solidifies to form part geometry
2. ***Particulate processing*** - starting material is a *powder*, and the powders are formed into desired geometry and then sintered to harden
3. ***Deformation processes*** - starting material is a *ductile solid* (commonly metal) that is deformed
4. ***Material removal processes*** - starting material is a *solid* (ductile or brittle), from which material is removed so resulting part has desired geometry



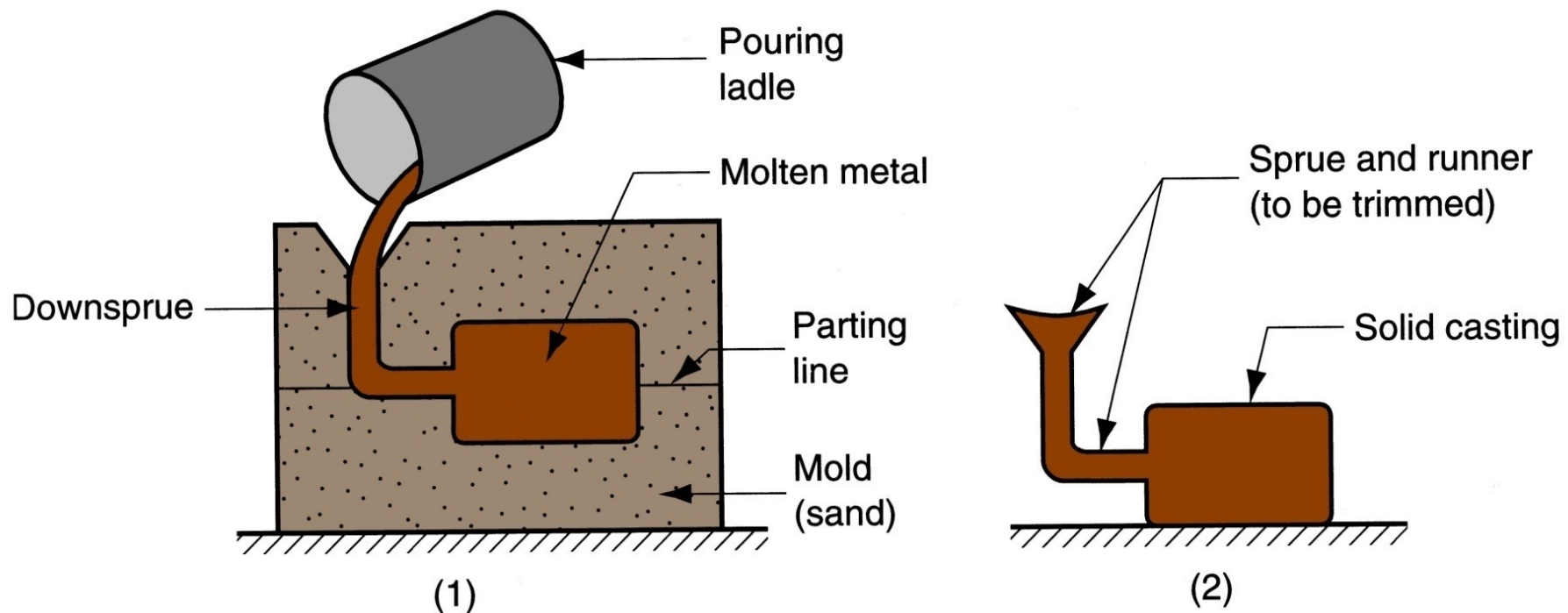
# Classification of Manufacturing Processes



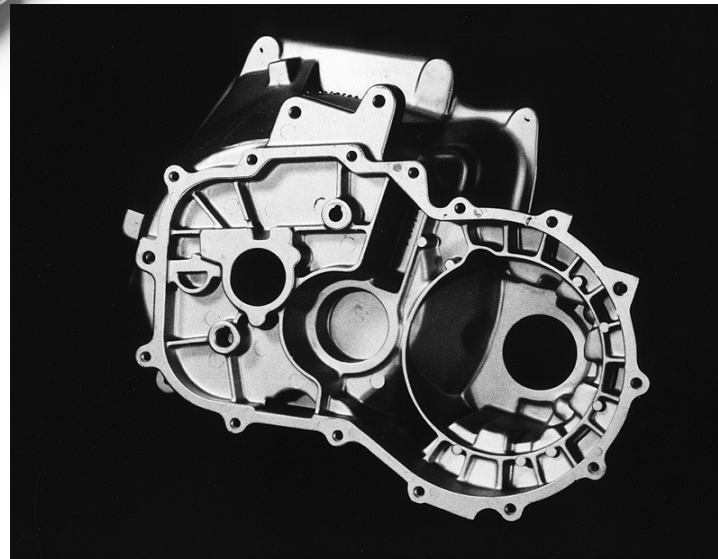
4 Major Manufacturing Processes

# 1. Solidification Processes **UTM** UNIVERSITI TEKNOLOGI MALAYSIA Transportation Research Alliance (TRA)

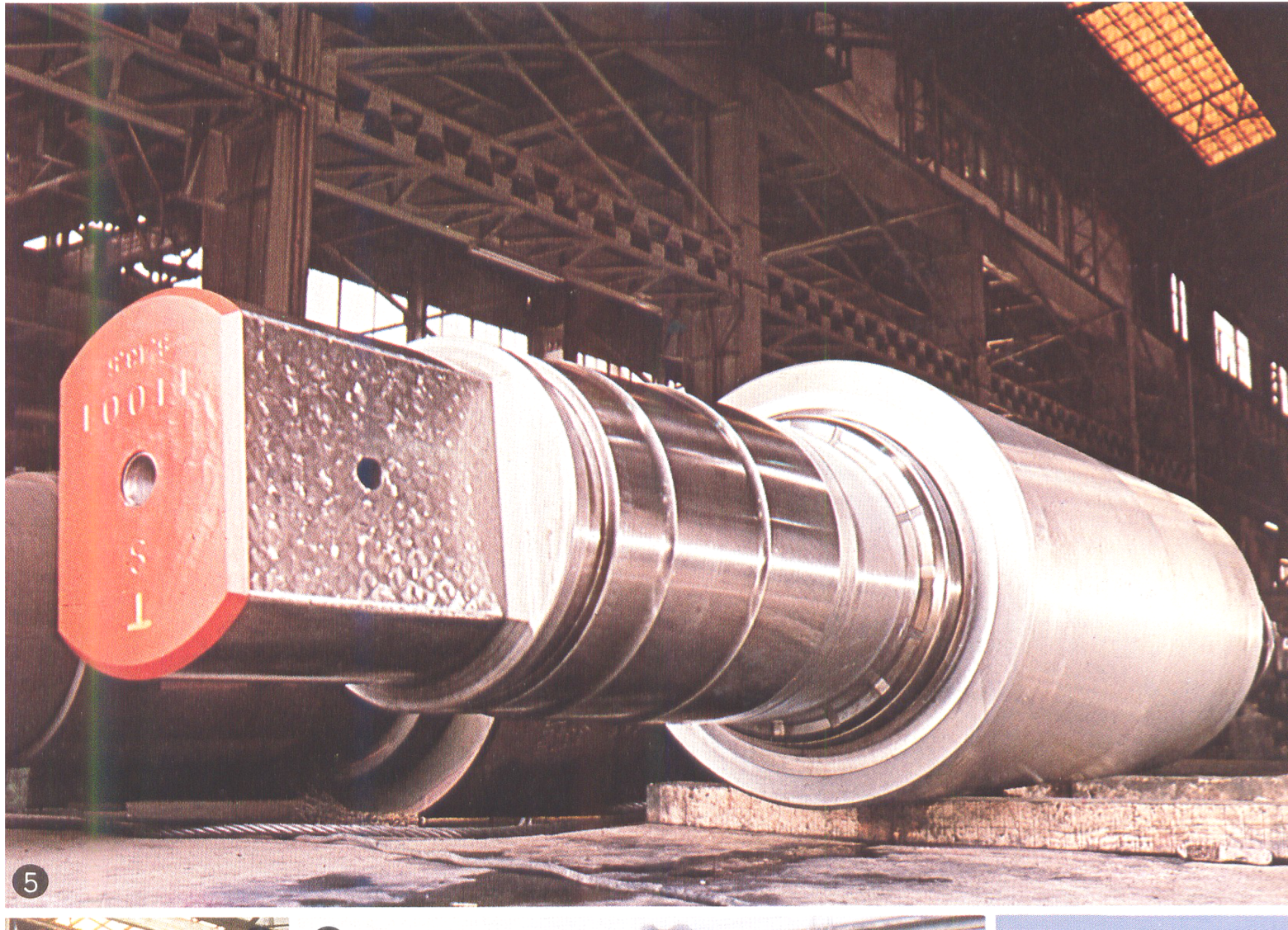
- Also known as casting process
- Starting material is heated sufficiently to transform it into a liquid or highly plastic state
- Examples: Casting for metals, molding for plastics



# Parts Made by Casting

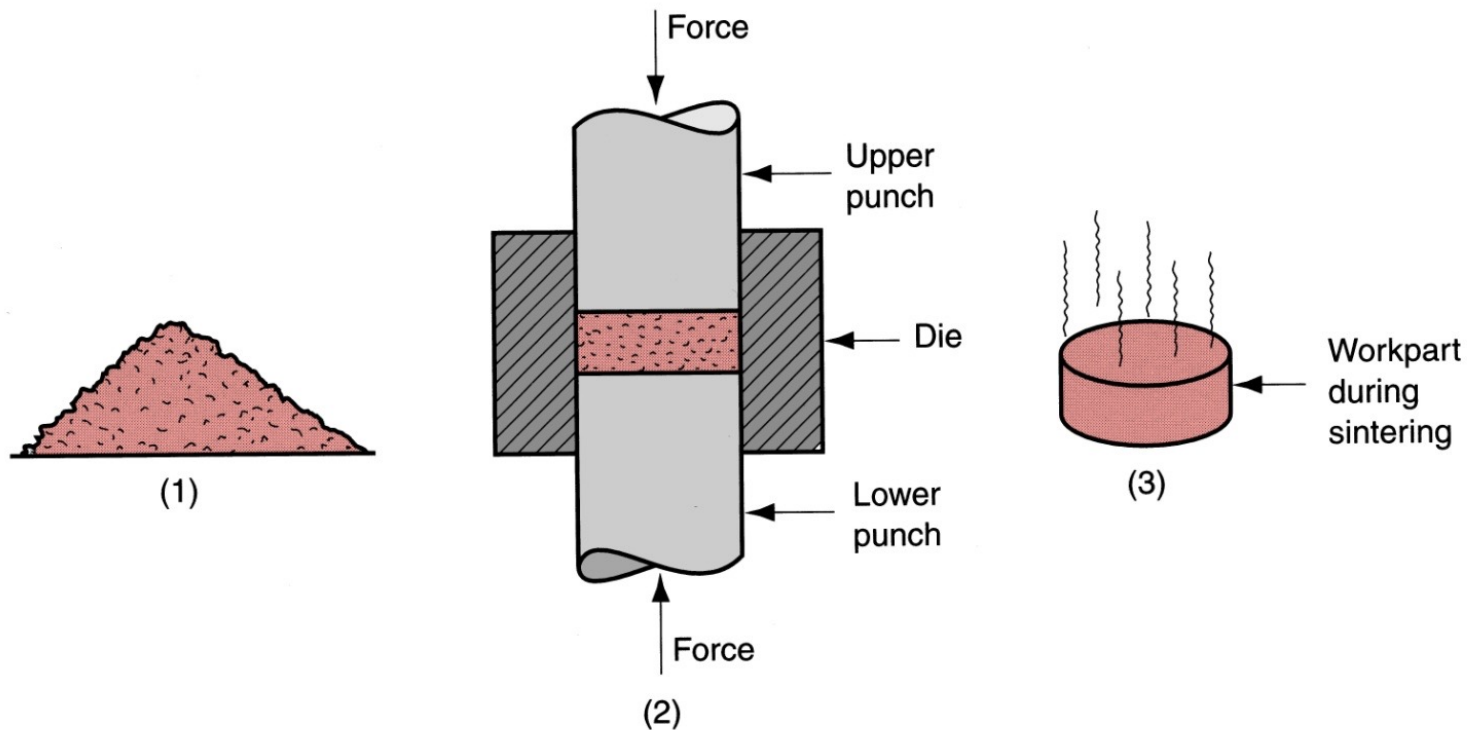


# Parts Made by Casting

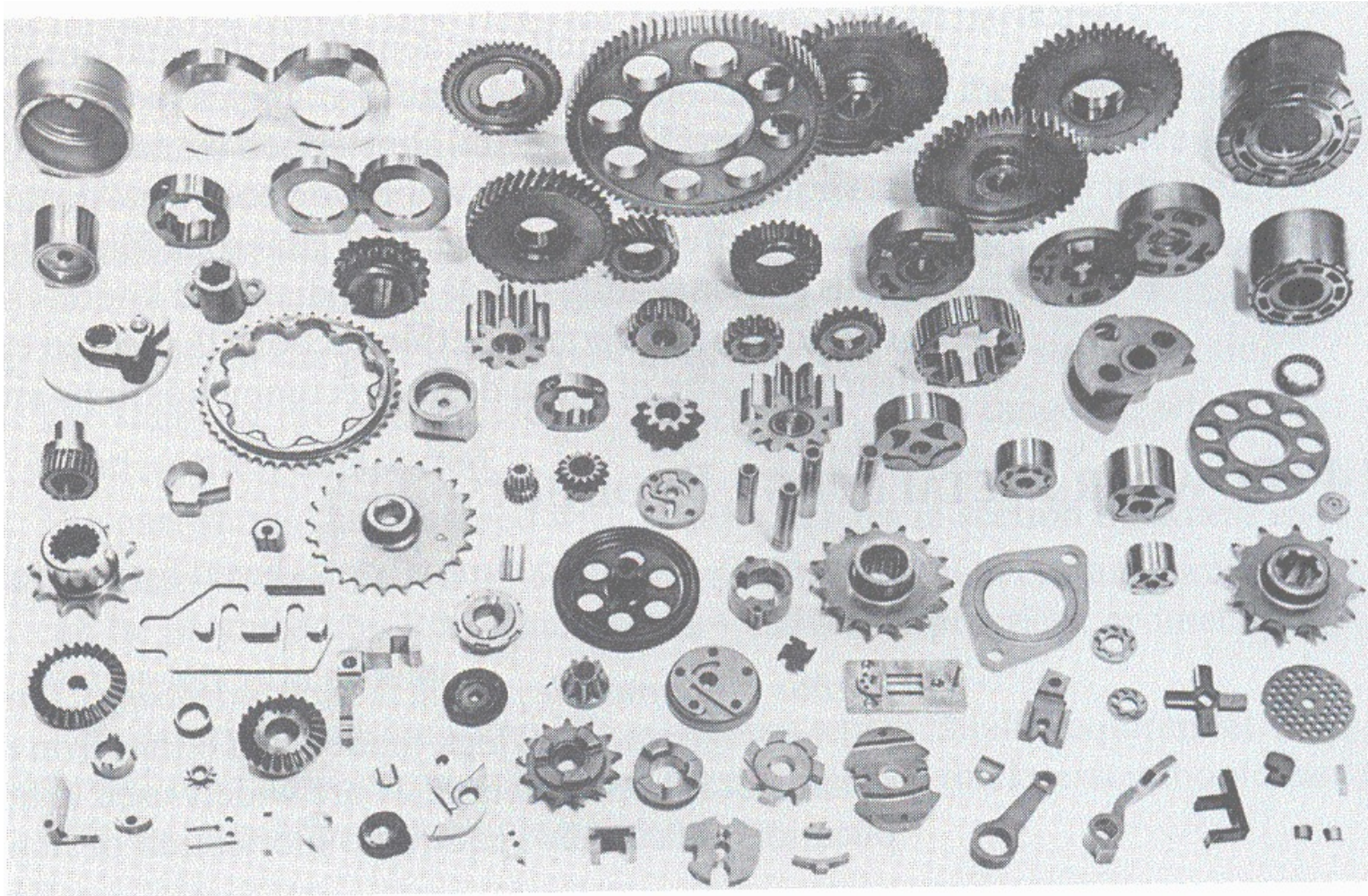


## 2. Particulate Processing **UTM** Transportation Research Alliance (TRA) UNIVERSITI TEKNOLOGI MALAYSIA

- Also known as powder metallurgy process
- Starting materials are powders of metals or ceramics
- Usually involves pressing and sintering

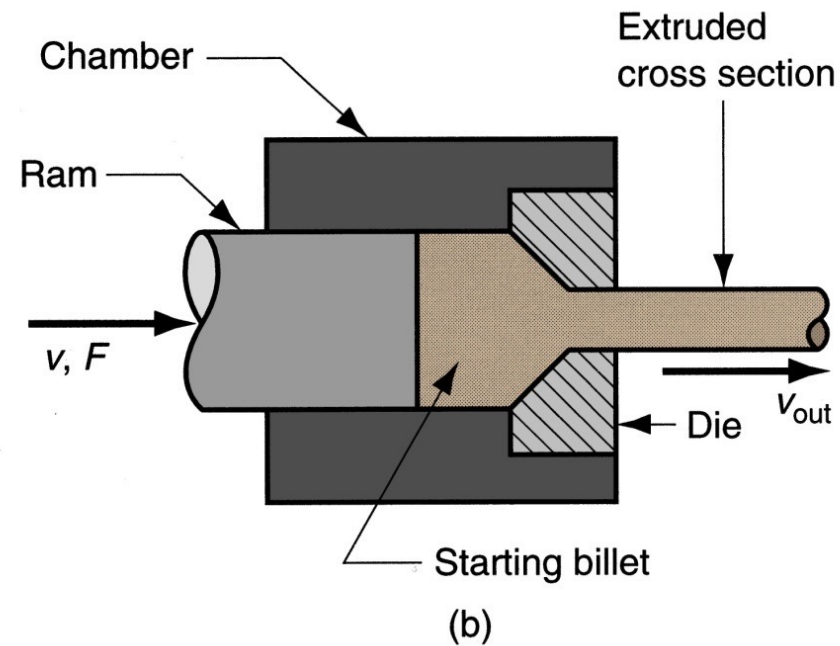
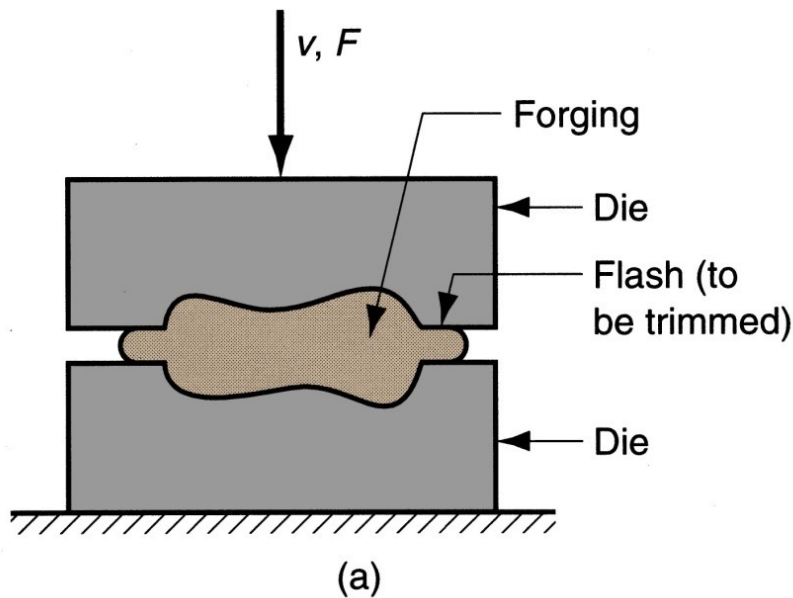


# PARTS MADE FROM POWDER METALLURGY PROCESS



# 3. Deformation Processes

- Also known as metal forming processes
- Starting workpart is shaped by application of forces that exceed the yield strength of the material
- Examples: (a) forging, (b) extrusion



# Bulk Metal Forming Parts



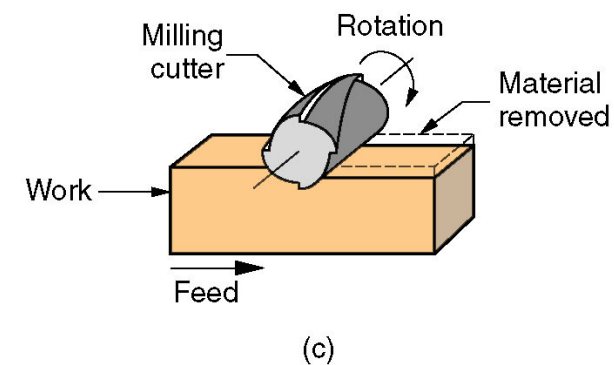
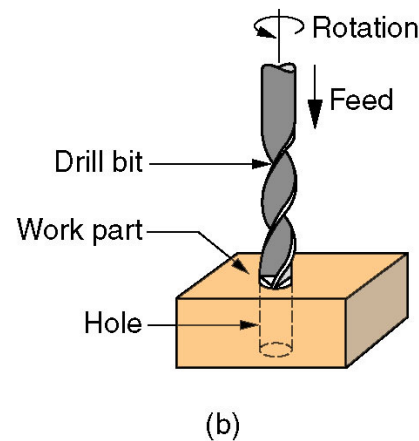
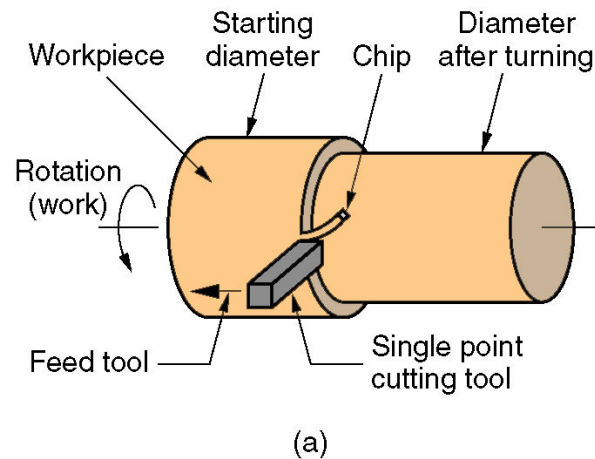


# Sheet Metal Forming Parts



# 4. Material Removal Processes

- Usually known as machining processes
- Excess material removed from the starting workpiece so what remains is the desired geometry
- Examples: machining such as turning, drilling, and milling; also grinding and nontraditional processes



# Machining Parts



## II. Assembly Operations

- Two or more separate parts are joined to form a new entity

### Types of assembly operations:

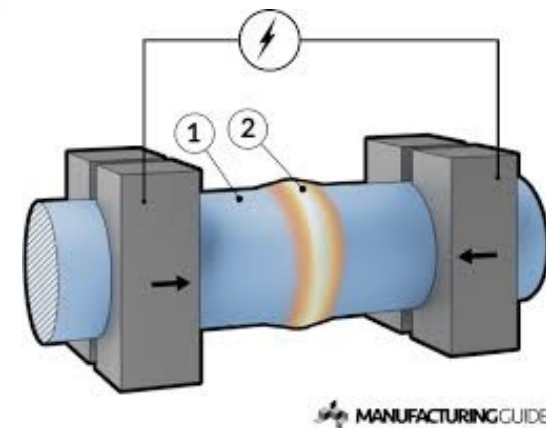
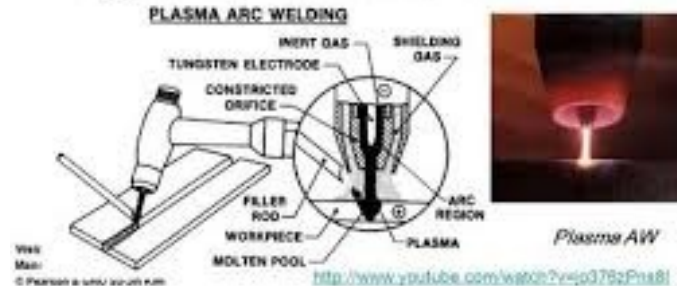
1. Joining processes – create a permanent joint.
  - *Examples: welding, brazing, soldering, and adhesive bonding*
2. Mechanical assembly – fastening by mechanical methods
  - Examples: use of screws, bolts, nuts, other threaded fasteners; press fitting, expansion fits

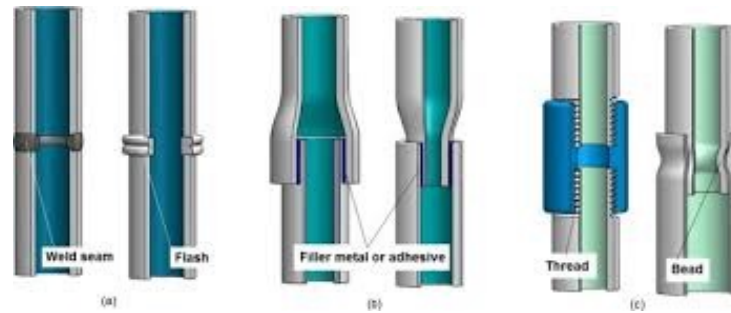
# Various type of joining and welding processes



## Plasma arc welding

- A concentrated plasma arc is produced and directed toward the weld area.
- Higher quality and speed than the TIG.

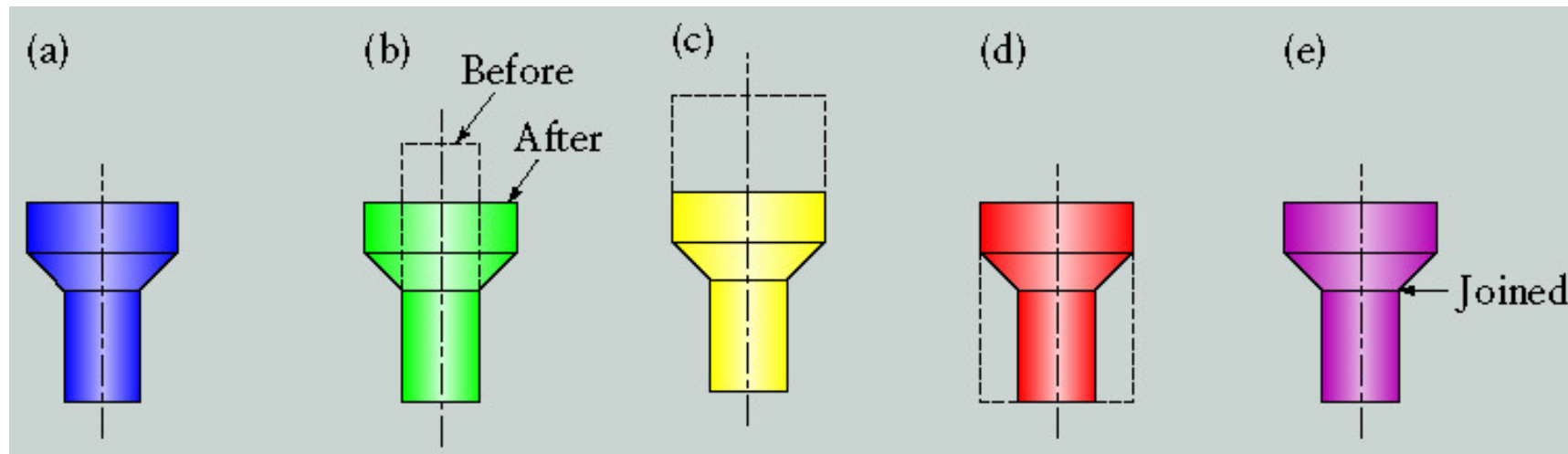




# Mechanical assembly and fasteners



# Methods of Making a Simple Part



Various methods of making a simple part. (a) casting or powder metallurgy, (b) forging or upsetting, (c) extrusion, (d) machining, and (e) joining two pieces.

*Thank  
you*

