

# COMPUTER AIDED ENGINEERING DESIGN (BFF2612)

## ASSEMBLY DESIGN

by

**Dr. Mohd Nizar Mhd Razali**

**Faculty of Manufacturing Engineering**  
**[mnizar@ump.edu.my](mailto:mnizar@ump.edu.my)**



Computer Aided Engineering  
Design: Dr Nizar

# ASSEMBLY DESIGN

- Assembly is a collection of independent parts.
- It must include mating conditions between parts, hierarchical relationships among the parts, and attachment between parts.
- In most engineering design, the product of interest is a composition or merge of parts, formed into an assembly.

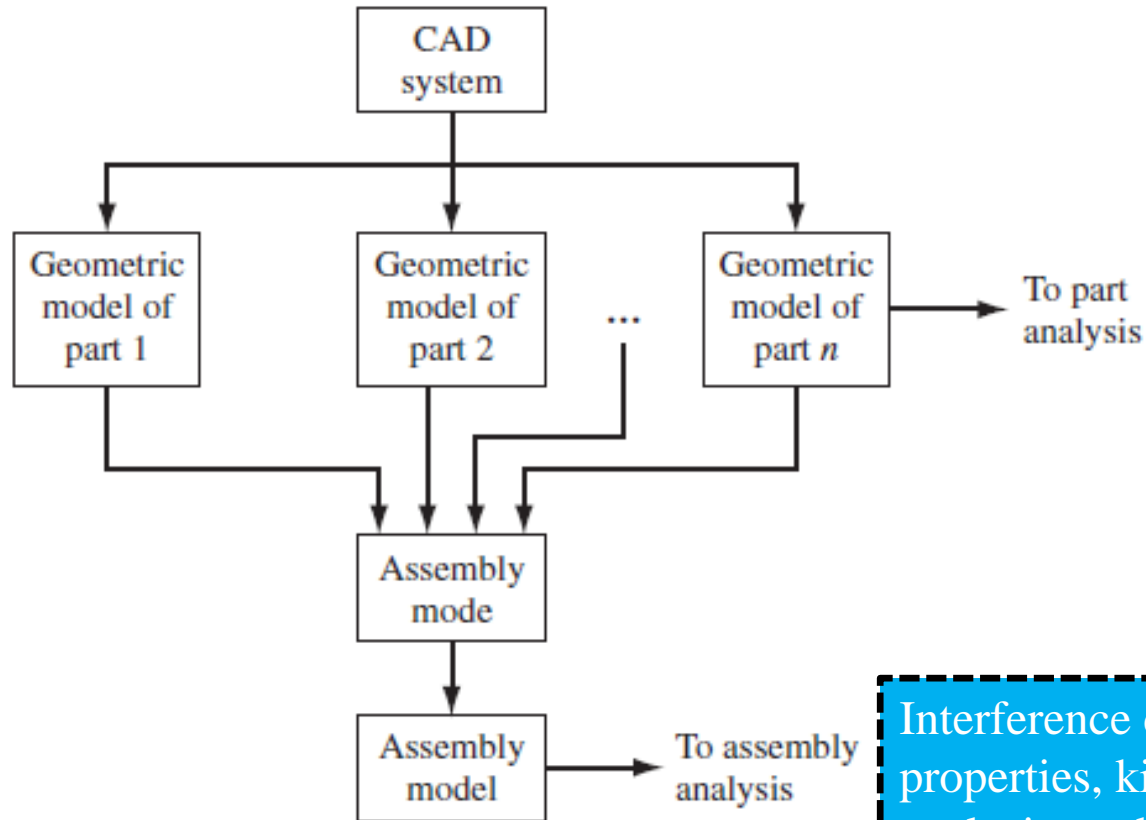


# ASSEMBLY MODELING

- Two modeling issues in assembly modeling that do not exist at the part modeling level:
  1. Hierarchy (Sequence).
  2. Mating (Spatial relationships and orientations).
- Individual parts and subassemblies must be assembled in the right hierarchy, which is captured in an assembly tree for each assembly or product.
- Mating conditions are used to determine the spatial relationships and orientations between the assembly parts.
- Example: Axes of a shaft and a hole may have to be lined up and at the same time the two faces may have to be planar.



# ASSEMBLY MODELING



Interference checking, mass properties, kinematic and dynamic analysis, and finite element analysis.



# ASSEMBLY PLANNING

- Assembly planning is the key to create successful assemblies.
- Before assembling the part, following issues have to be considered:
  1. Identify the dependencies between the components of an assembly.
  2. Identify the dependencies between the features of each part.
  3. Analyze the order of assembling the parts.

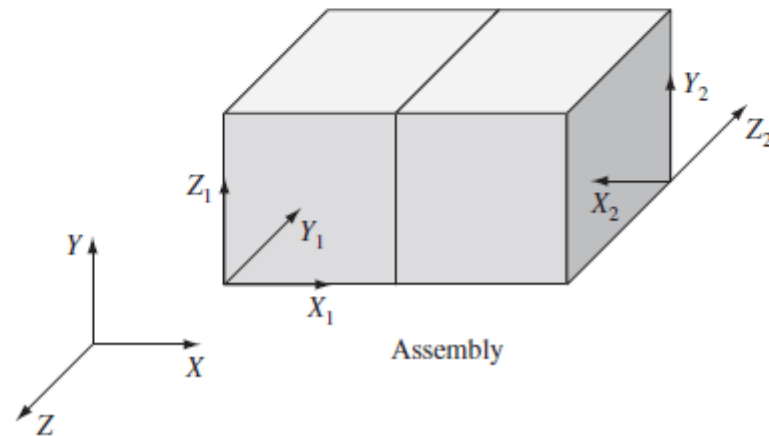
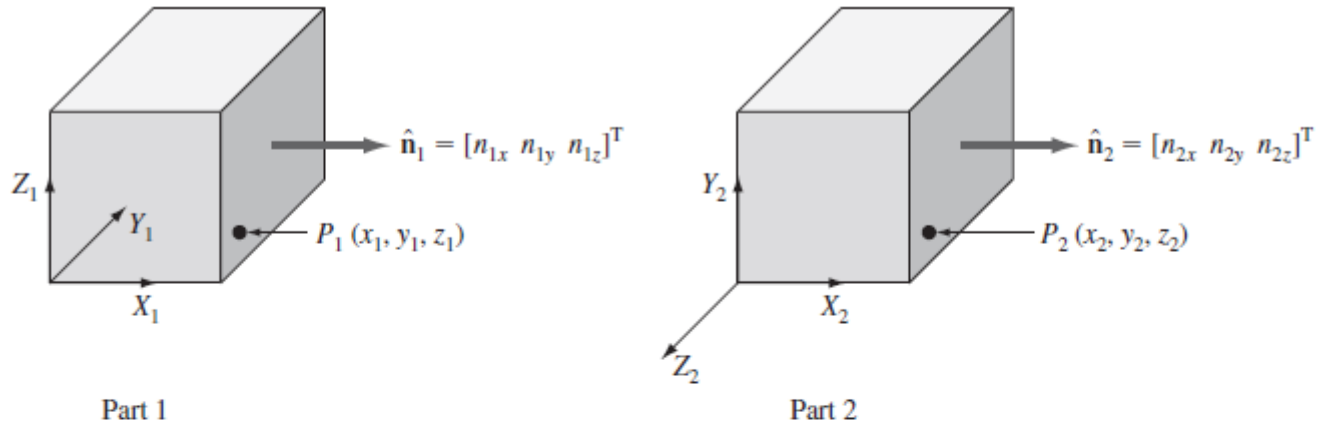


# MATING CONDITIONS

- Locating and orienting parts in their assembly is achieved by specifying mating conditions among them.
- The most common mating conditions are *tangent, coincident, coplanar, concentric, perpendicular faces and parallel faces.*

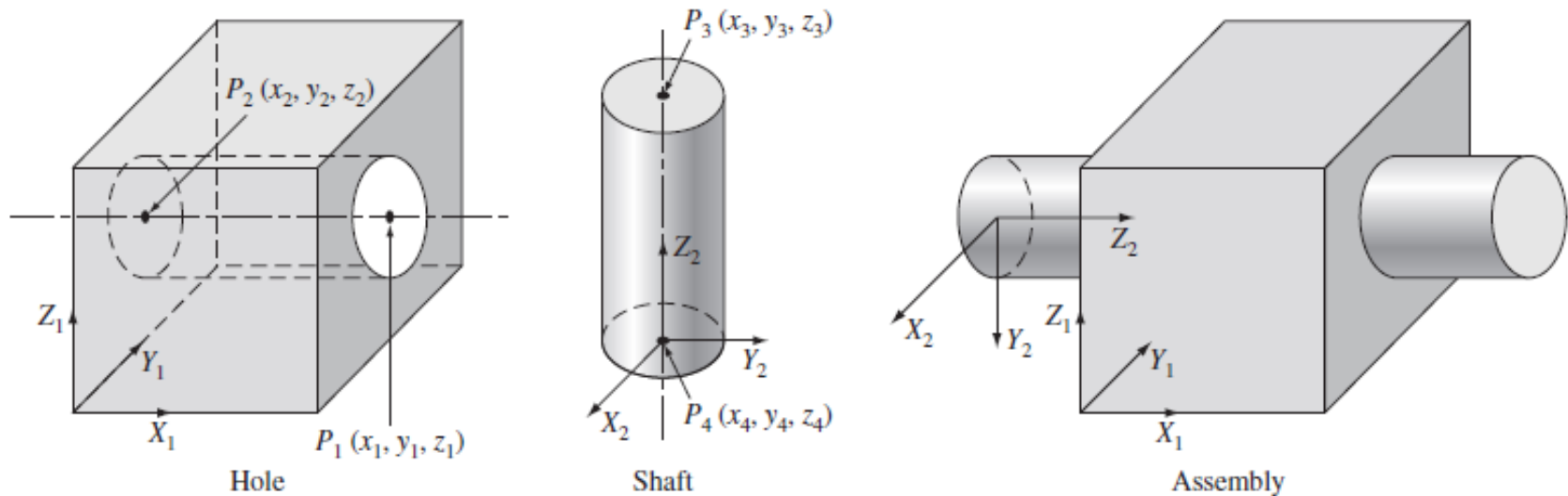


# MATING CONDITIONS



**COINCIDENT  
CONDITION**

# MATING CONDITIONS

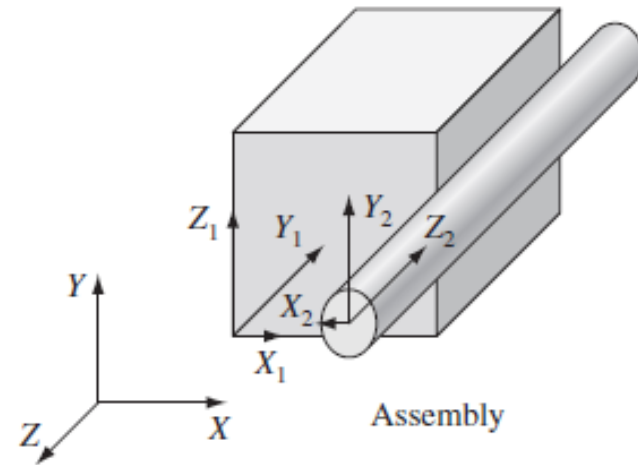
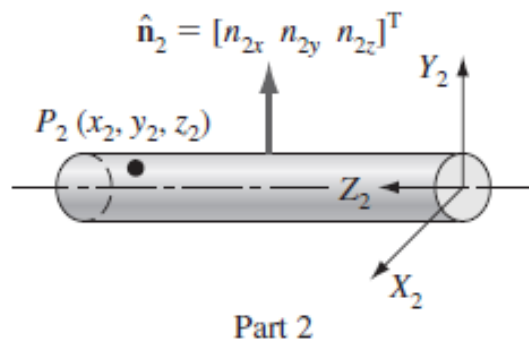
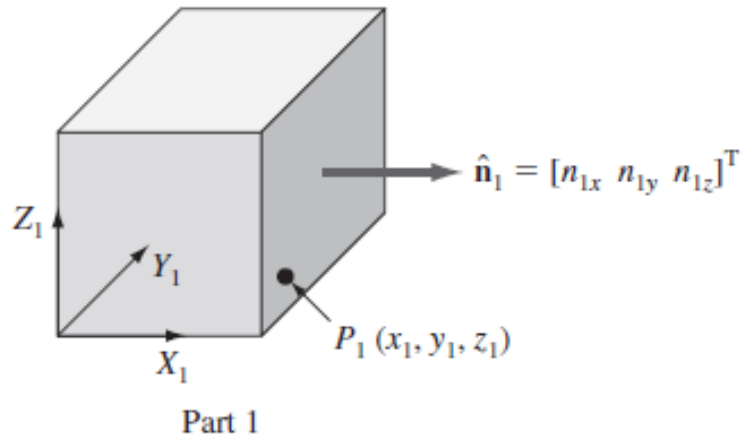


## CONCENTRIC CONDITION





# MATING CONDITIONS



**TANGENT  
CONDITION**



# ASSEMBLY APPROACHES

- **Bottom-Up**
- **Top-Down**
- **Combination of both**



# ASSEMBLY APPROACHES

## Bottom-Up

- Most commonly use because of the traditional and most logical approach.
- Create the individual parts independently, insert them into an assembly, and use the mating conditions to locate and orient them in the assembly as required by the assembly design.
- **Advantages:**
  - It is preferred technique if the parts have already been constructed.
  - Allows designers to focus on the individual parts.
  - It makes easier and simpler to maintain the relationship and regeneration behaviour of parts than in the top-down approach.

# ASSEMBLY APPROACHES

## Top-Down

- Create the sketch directly in assembly layout sketch to define components in the context of assembly.
- The assembly layout sketch defines skeletal, space claim, and other physical properties that may be used to define the geometry of and the relationship between components.
- **Advantages:**
  - Good for any size assembly, ideal for large assemblies consisting of tens of thousands of components.
  - Provides an effective tool and a well-organized approach to managing the design of large assemblies.

If we change the layout sketch, the assembly and its parts are automatically updated upon exiting the sketch.



# Lab. Exercise 5

## Assembly Modeling (Toy Excavator)



Assembly Design



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Thank you  
and Have a nice day!



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