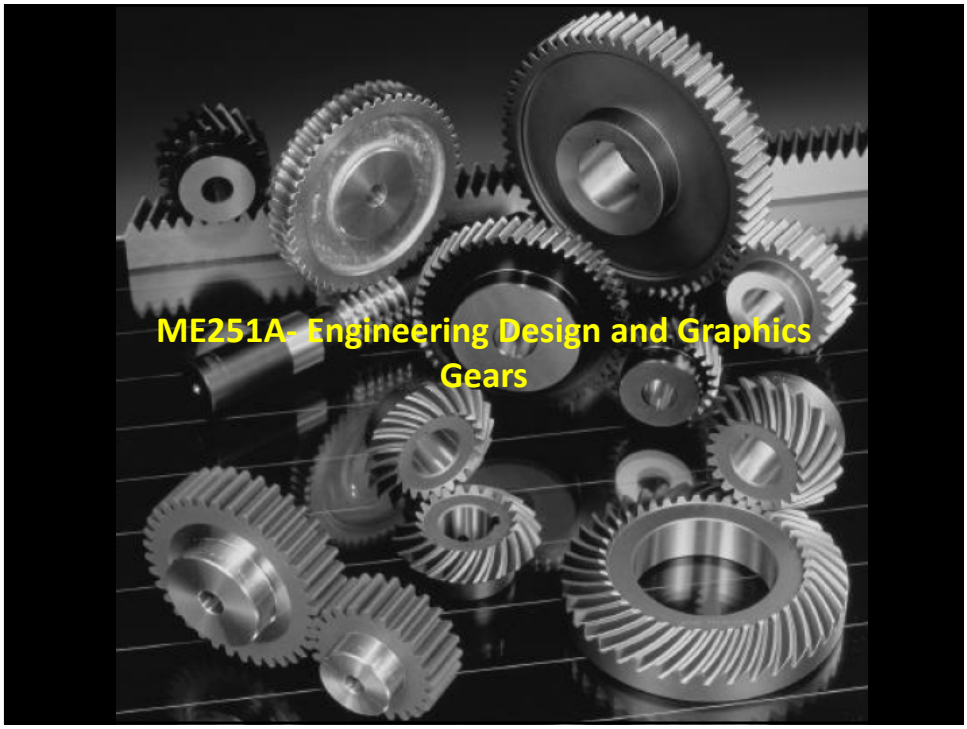
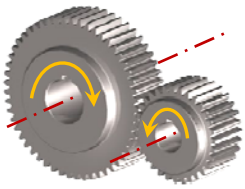


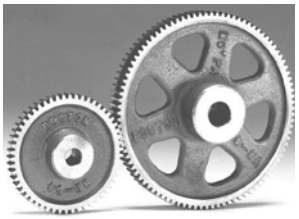
Gears

- Gears are toothed cylindrical or conical wheels used for power transmission with or without speed reduction
- Types of gears
  - Spur gears
  - Helical gears
  - Rack and pinion
  - Bevel gears
  - Hypoid gears
  - Worm and worm wheel
- Internal and external

Spur gears

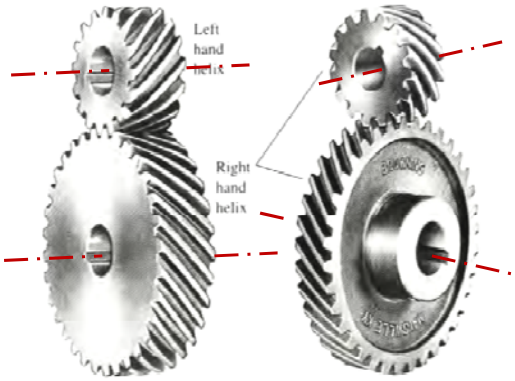
- Teeth are parallel to the axis of rotation
- Used for transmitting power between parallel shafts





Helical gears

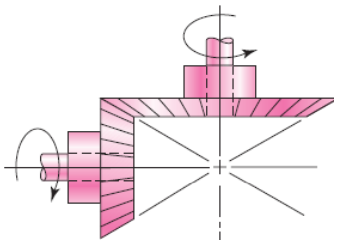
- Teeth are inclined to the axis of rotation
- Relatively quieter in operation
- Can be used for transmitting power between non-parallel shafts also

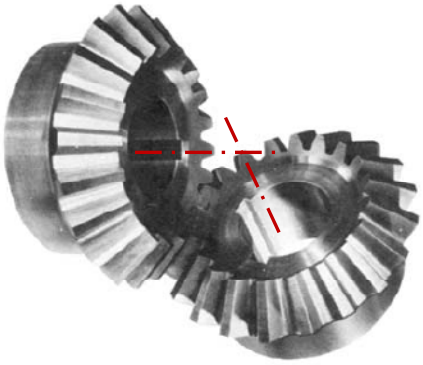


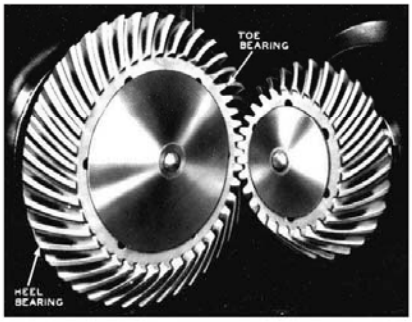
(a) Helical gears with parallel shafts (b) Crossed helical gears, shafts at right angle

Bevel gears

- Teeth are formed on a conical surface
- Teeth can be straight or spiral
- Used for transmitting power between perpendicular intersecting shafts





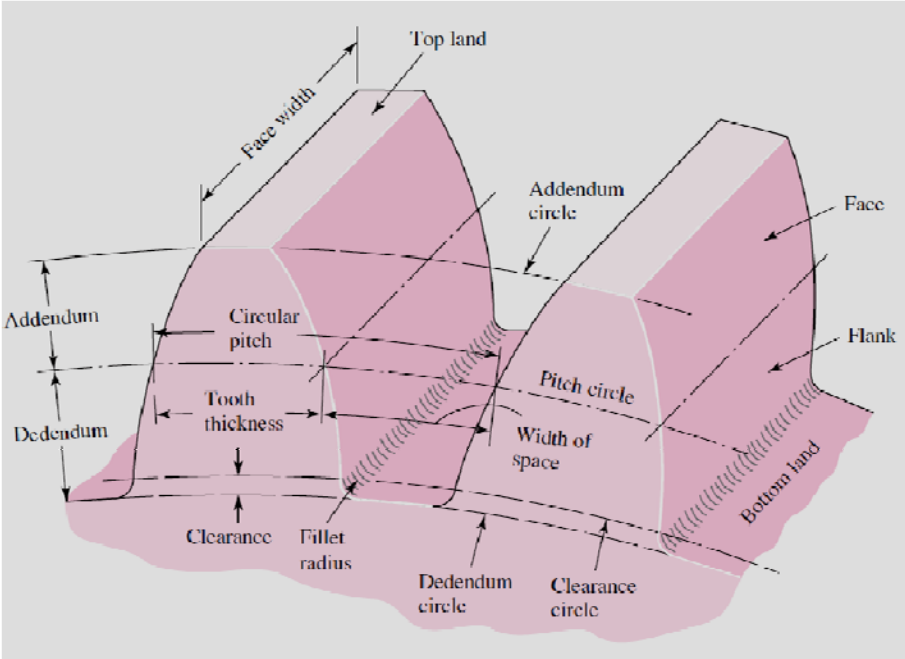


Hypoid gears

- Similar to bevel gear but shafts can be offset, perpendicular to each other

Worm and Worm wheel

- Shafts perpendicular, non intersecting
- Large speed reduction possible



Spur gear tooth geometry

Pitch circle

- Theoretical circle upon which all calculations are made
- Its diameter is called pitch circle diameter – d
- Pitch circles of two mating gears are tangent to each other

Addendum, *a*

- Radial distance between top land and pitch circle

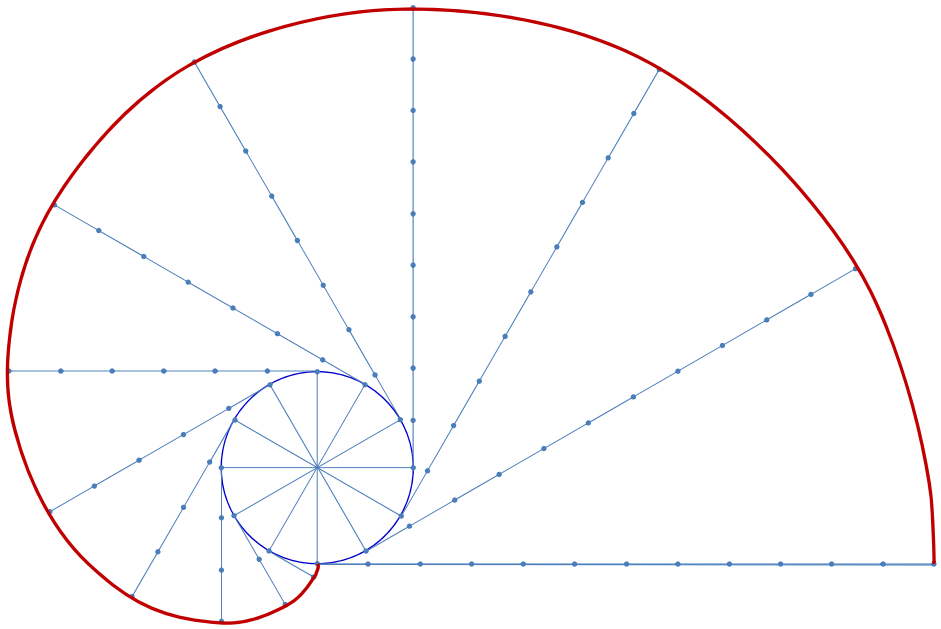
Circular pitch (*p*)

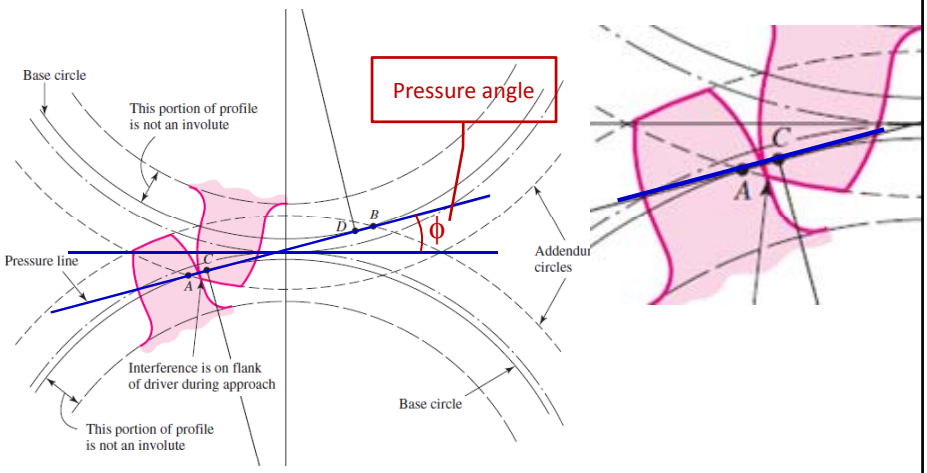
- Distance measured on the pitch circle from a point on the tooth to the corresponding point on an adjacent tooth
- p = tooth thickness + width of space (measured on PC)
- $p = \pi d/N$, N is number of teeth

Dedendum, *b*

- Radial distance between bottom land and pitch circle

Tooth profile- Involute

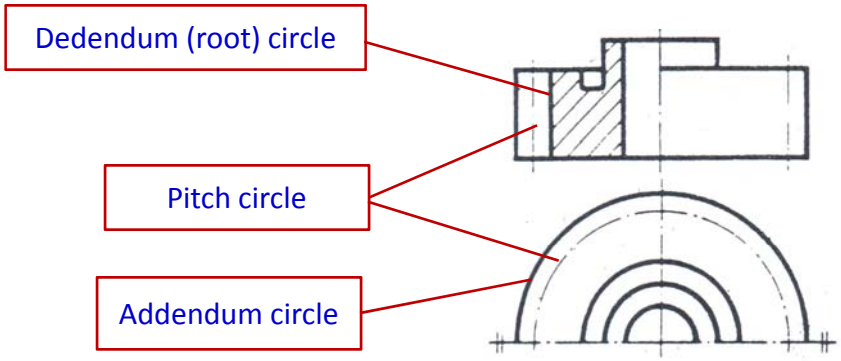




- **Module**
  - $m = d/N$ (standard values given in data book)
- *a* and *b* have definite proportion with *m* in a standard gear
  - For 20° pressure angle, a = m and b = 1.25m

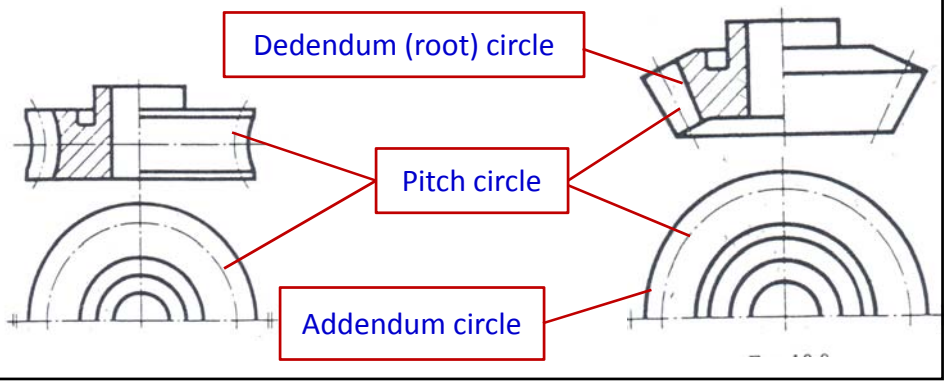
Representation of gears in drawings

- A gear is represented as a solid part without teeth **but with addition of the pitch surface in a thin long chain line**



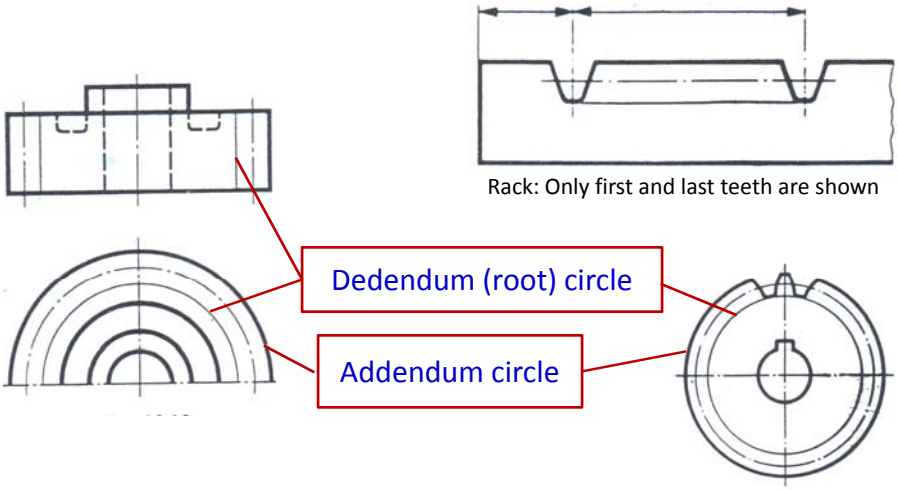
Representation of gears in drawings

- Pitch surface: Draw the pitch surface with thin long chain line **even in concealed portions and sectional views**
  - **In projection normal to axis by pitch circle**
  - **In projection parallel to axis extending the line beyond the gear on each side**
- Dedendum (root) surface is shown only in sectional views



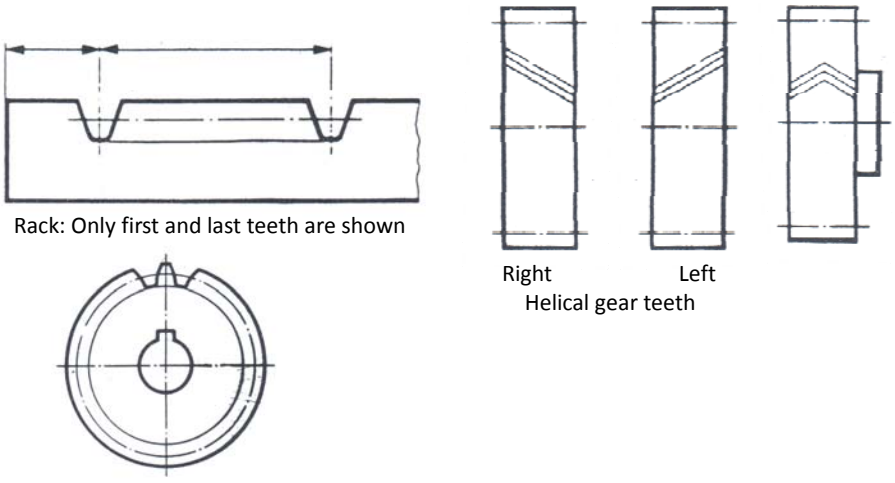
Representation of gears in drawings

- The dedendum (root) surface is indicated in a non-sectioned view if it is helpful with **thin continuous** line

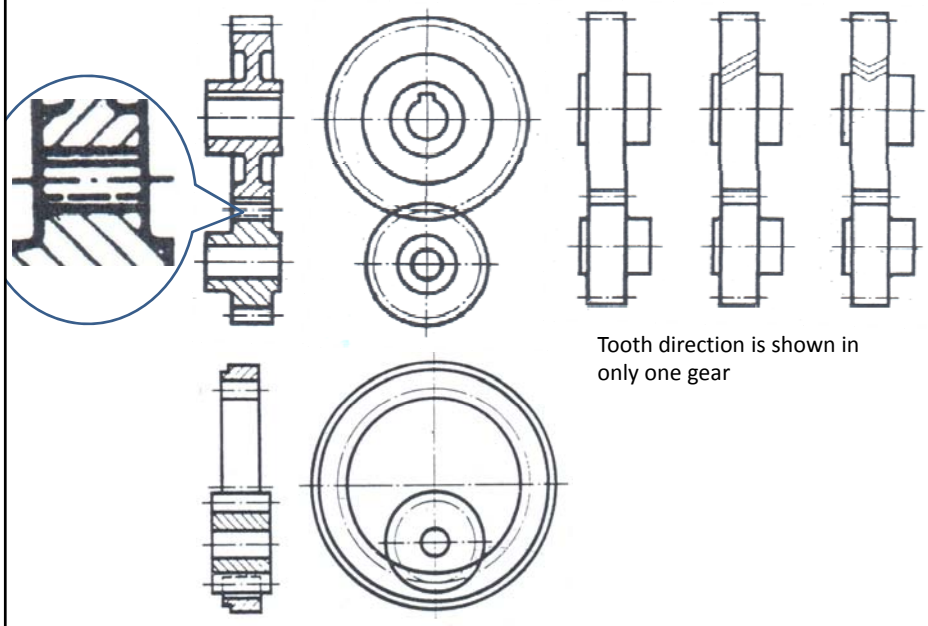


Representation of gear teeth

- Specify the teeth profile by reference to a standard or drawing to a suitable scale

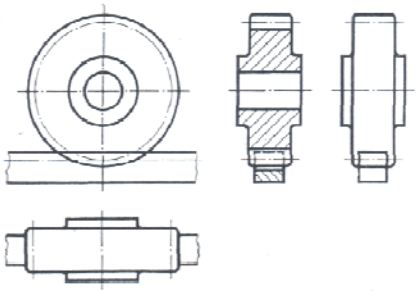


Representation in assembly drawing: Gear pairs

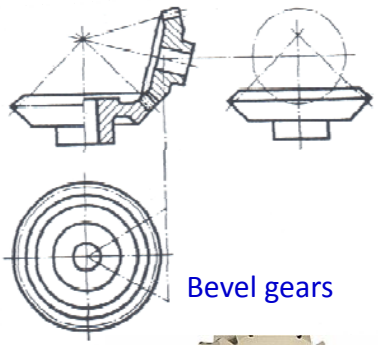


Tooth direction is shown in only one gear

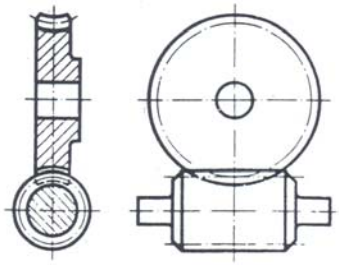
Representation in assembly drawing: Gear pairs



Rack and pinion



Bevel gears



Cylindrical worm and worm wheel