

Lecture_1

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1. Overall Purpose

Synthesis:

Analysis:

Kinematics:

Kinetics:

2. Mechanisms and Machines

Machine:

Mechanism:

Mechanism types

3. Degree of freedom (mobility)

Links:

Types of Links:

Joints:

Types of Joints:

1. Overall Purpose

- Synthesis of mechanisms to accomplish desired motions or tasks
- Analysis of mechanisms to determine their rigid-body dynamic behavior
- The above relates to kinematics and kinetics

Synthesis:

the composition or combination of parts or elements so as to form a whole

Analysis:

a detailed examination of anything complex in order to understand its nature or to determine its essential features

Kinematics:

the study of motion **without** regard of forces

Kinetics:

the study of forces in motion

2. Mechanisms and Machines

Machine:

transfer energy

Mechanism:

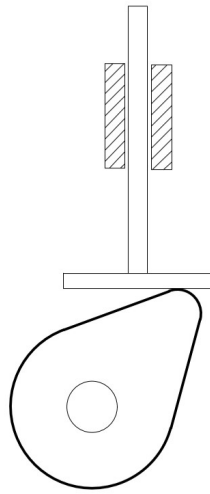
transfer movement

Bar

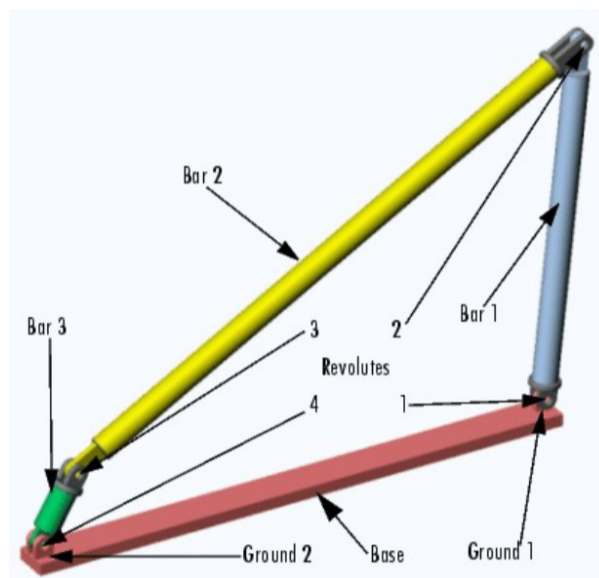
any member which are subjected to axial (Tensile/Compressive but no Transverse/Torsional loads) loads only

Mechanism types

- 3 bar mechanism



- 4 bar mechanism



3. Degree of freedom (mobility)

the number of independent parameters to uniquely define system position in space has 6 DOF

Links:

- Binary link: one with two nodes
- Ternary link: one with three nodes
- Quaternary link: one with four nodes

Types of Links:

- **Crank:** a link that makes a complete revolution and is pivoted to the ground
- **Rocker:** a link that has oscillatory (back and forth) rotation and is pivoted to ground
- **Coupler (Connecting rod):** a link that has complex motion and is not pivoted to ground

- **Ground:** any link or links that are fixed (nonmoving) with respect to the reference frame

Joints:

a connection between two or more links (at their nodes). Joints also called Kinematic pairs

Types of Joints:

- **Lower pair:** an ideal joint that constrains contact between a surface in the moving body to a corresponding surface in the fixed body
- **Higher pair:** a constraint that requires a curve in the moving body to maintain with a curve or surface in the fixed body

Joints may be form closed or force closed