ABOUT THE SUBJECT

This subject mainly deals with mechanisms of various machines which include position displacement velocity and acceleration that we come across in our day today life without giving much importance to FORCE or MASS. The subject also deals with graphical and analytical interpretation. The other chapters of interest are Velocity and Acceleration of mechanisms by Complex Numbers, gears, gear trains ,and analysis of Cam profiles.

Special emphasis is given to velocity and acceleration followed by Cams as these problems are solve on drawing sheets in the University Exams.

UNIT I BASICS OF MECHANISMS

1.1 Introduction:
Definitions : Link or Element, Pairing of Elements with degrees of freedom, Grubler's criterion without derivation), Kinematic chain, Mechanism, Mobility of Mechanism, Inversions, Machine.

1.1.1 Kinematic Chains and Inversions:
Kinematic chain with three lower pairs, Four bar chain, Single slider crank chain and Double slider crank chain and

their inversions.

1.1.2 Mechanisms:
i Quick return motion mechanisms – Drag link mechanism, Whitworth mechanism and Crank and slotted lever mechanism

ii Straight li ne motion mechanisms – Peacelier's mechanism and Robert's mechanism.

iii Intermittent motion mechanisms – Geneva mechanism and Ratchet & Pawl mechanism.

iv) Toggle mechanism, Pantograph, Hooke's joint and Ackerman Steering gear mechanism.

1.1.3 Terminology and Definitions-Degree of Freedom, Mobility
- **Kinematics:** The study of motion position, velocity, acceleration). A major goal of understanding kinematics is to develop the ability to design a system that will satisfy specified motion requirements. This will be the emphasis of this class.
- **Kinetics:** The effect of forces on moving bodies. Good kinematic design should produce good kinetics.
- **Mechanism:** A system design to transmit motion. (low forces
- **Machine:** A system designed to transmit motion and energy. forces involved)
- **Basic Mechanisms:** Includes geared systems, cam-follower systems and linkages rigid links connected by sliding or rotating joints. A mechanism has multiple moving parts for example, a simple hinged door does not qualify as a mechanism.

- **Examples of mechanisms:** Tin snips, vise grips, car suspension, backhoe, piston engine, folding chair, windshield wiper drive system, etc.

1.1.4 Key concepts:

- **Degrees of freedom:** The number of inputs required to completely control a system. **Examples:** A simple rotating link. A two link system. A four-bar linkage. A five-bar linkage.
- **Types of motion:** Mechanisms may produce motions that are pure rotation, pure translation, or a combination of the two. We reduce the degrees of freedom of a mechanism by restraining the ability of the mechanism to move in translation x -y directions for a 2D mechanism or in rotation (about the z -axis for a 2-D mechanism.
- **Link:** A rigid body with two or more nodes joints that are used to connect to other ri gid bodies. (WM examples: binary link, ternary link 3 join ts, quaternary link (4 joints
- **Joint:** A connection between two links that allows motion between the links. The motion allowed may be rotational revolute joint, translational sliding or prismatic joint, or a combination of the two (roll-slide joint.
- **Kinematic chain:** An assembly of links and joints used to coordinate an output motion with an input motion.
- **Link or element:**
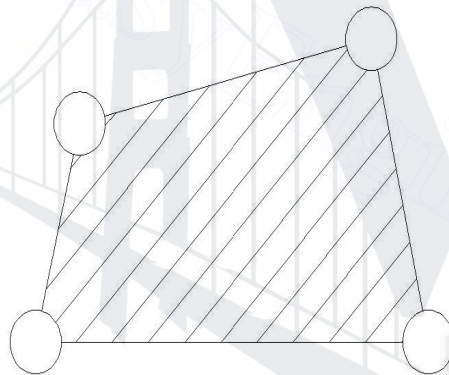
A mechanism is made of a number of resistant bodies outof which some may have motions relative to the others. Aresistant body or a group of resistant bodies with rigidconnections preventing their relative movement is known as alink.

A link may also be defined as a member or a combination ofmembers of a mechanism, connecting other members and havingmotion relative to them, thus a link may consist of one or moreresistant bodies. A link is also known as Kinematic link or anelement.

Links can be classified into 1) Binary, 2 Ternary, 3) Quarternary, etc.

- **Kinematic Pair:**

A Kinematic Pair or simply a pair is a joint of two links having relative motion between them.