1. STATICS

FORCE: It requires Magnitude, direction and point of application.

RESOLUTION OF FORCES: If a force makes angle with X axis then,

The *cosine* component will be along X axis.	The *sine* component will be along Y axis.

THEOREM OF TRANSMISSIBILITY: Force can be shifted along it's line of action without changing It's effect.

MOMENT: $\vec{M} = \vec{R} \times \vec{P}$.	Clockwise Considered $-ve$	Anti-Clockwise Considered $+ve$

1. Use Right hand thumb rule to determine the direction of moment.
2. Moment value on any point on line of action of force is zero.

THEOREM OF VARIGNON:

Moment of a force about a point is same as moment vector addition of component of force about the same point.

COUPLE: Two Equal and opposite force separated by some distance creates couple.

$M = Force * \perp distance$	It can't produce translation effect.
It can only produce rotational effect.	It can be only balanced by another equal and opposite couple.

TYPES OF FORCES		
COPLANAR	**PARALLEL**	**CONCURRENT**
All Forces are in one plane.	Forces are parallel to each other	Forces Passing through single point

EQUILIBRIUM CONDITIONS					
$\sum F_x = 0$	$\sum F_y = 0$	$\sum F_z = 0$	$\sum M_x = 0$	$\sum M_y = 0$	$\sum M_z = 0$

For Co-Planar forces there are 3 equations only for equilibrium condition.

EQUILIBRIUM OF TWO FORCES: Two forces can be in equilibrium if they are,

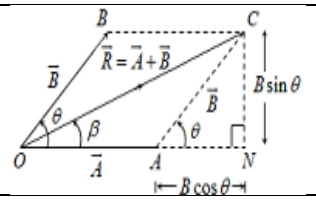
Equal in magnitude	Opposite in direction	Colinear

RESULTANT OF TWO FORCES: Resultant force is obtained when two forces are not in equilibrium condition.

PARALLELOGRAM LAW:

$$\vec{R} = \vec{A} + \vec{B} = (A + B\cos\theta)\hat{\imath} + B\sin\theta\,\hat{\jmath}$$

$$|\vec{R}| = \sqrt{A^2 + B^2 + 2AB\cos\theta}\,,\ \tan\beta = (B\sin\theta)/(A + B\cos\theta)$$



COSINE RULE:

$a^2=b^2+c^2 - 2bc\cos A$

$b^2=a^2+c^2 - 2ac\cos B$

$c^2=a^2+b^2 - 2ab\cos C$

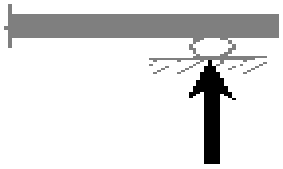
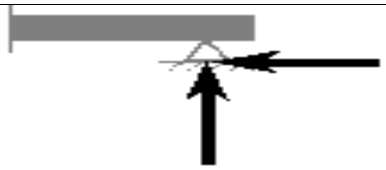
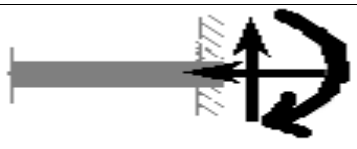
	Like Forces	Unlike Forces	$\vec{A} \perp \vec{B}$	$\vec{R} \perp \vec{A}$
θ	$0°$	$180°$	$90°$	$> 90°$
$\lvert\vec{R}\rvert$	$A + B = Max\ Value$	$A - B = Min\ Value$	$\lvert\vec{R}\rvert = \sqrt{A^2 + B^2}$	$R = B\sin\theta\ \&P = -Q\cos\theta$
β	$0°$	$either\ 0°\ or\ 180°$	$\tan^{-1}(B/A)$	$90°$

RESULTANT OF COPLANAR FORCE SYSTEM	$R = \sqrt{\left(\sum F_x\right)^2 + \left(\sum F_y\right)^2}$	$\tan\beta = \frac{F_y}{F_x}$

CONDITION FOR EQUILIBRIUM OF 3 FORCES:

1) Co-Planar, 2) Concurrent, 3) Polygon must be a closed triangle

LAMI'S THEOREM/ SINE RULE: It's valid for 3 forces are in equilibrium	$\frac{P}{\sin\alpha} = \frac{Q}{\sin\beta} = \frac{R}{\sin\gamma} = Constant$

TYPES OF JOINTS OR SUPPORTS		
ROLLER SUPPORT	**PIN OR HINGE SUPPORT**	**FIXED SUPPORT**
		

Above Arrow signs indicates the Possible opposite reactions.

FREE BODY DIAGRAMS (FBD):	**TOTAL SYSTEM FREE BODY DIAGRAMS (FBD):**

1. Weight of The Part
2. External Force on The Body
3. Support Reactions
  a. Normal Reaction
  b. Frictional Force
4. Inertia Force
	1. Weight of The Parts
	2. External Forces
	3. Support Reactions
	  a. Normal Reaction
	  b. Frictional Force
	4. Inertia Forces
	5. No Internal Forces

TENSILE FORCE: Show tension towards the other end.