



MEC 135-BASICS OF MECHANICAL ENGINEERING

L : 2, T: 1, P: 0 CREDIT: 3

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Professor,
Lovely Professional University, Punjab.



COURSE ATTAINMENT

Course Outcomes: Through this course students should be able to

- CO1 :: understand the fundamentals of engineering drawing including usages of drawing tools, line-types, dimensioning, letter-writing, scales and other conventions.
- CO2 :: recognize and apply the conceptual framework of orthographic projections and acquire visualization skills.
- CO3 :: learn the techniques to draw the isometric projections of objects.
- CO4 :: describe and analyze the forces and their several effects on rigid bodies in equilibrium.
- CO5 :: understand the importance of centrod, center of gravity and moment of inertia of areas and pertinent calculations.
- CO6 :: acquaint with the concepts of trusses and their designing pertinent to force calculations.

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COURSE CONTENT

Unit I

Fundamentals of Engineering Drawing : Principles of engineering drawing and its importance, drawing instruments, line-types with applications, dimensioning, single stroke vertical Gothic letter writing, plane and diagonal scales, BIS norms

Unit II

Orthographic Projections : Introduction, principles, orthographic projections in first angle and third angle projections systems, practice

Unit III

Isometric Projections : Introduction, principles, terminology, isometric scale, isometric drawings and projections of stepped, inclined, oblique, and cylindrical blocks, isometric dimensioning, practice

Unit IV

Mechanics and Analysis of Forces : Introduction, fundamentals of forces and force systems, free body diagrams, coplanar concurrent forces, 2D force components and their resultant, fundamentals of moment of forces with applications, couples, equations of static equilibrium, numerical case studies

Unit V

Centroid, Center of Gravity and Moment of Inertia : Introduction, centroid of areas, composite area, cut-out sections and lines, theorems of moment of inertia, moment of inertia of laminas, channels, composite sections and cut-out sections, mass moment of inertia of thin plates, numerical case studies

Unit VI

Analysis of Trusses : Introduction, basic concepts, plane trusses, analysis of truss by method of joint and method of sections, numerical case studies



TEXT BOOKS AND REFERENCES

Books:

1. ENGINEERING DRAWING WITH AN INTRODUCTION TO AUTOCAD by DHANANJAY JOLHE, MC GRAW HILL
2. VECTOR MECHANICS FOR ENGINEERS: STATICS AND DYNAMICS by FERDINAND P. BEER, E. RUSSELL JOHNSTON, PHILLIP J. CORNWELL, SANJEEV SANGHI, MC GRAW HILL

References:

1. ENGINEERING GRAPHICS FOR DEGREE by K.C. JOHN, PRENTICE HALL
2. ENGINEERING DRAWING by N. D. BHATT, CHAROTAR PUBLISHING HOUSE PVT. LTD.
3. ENGINEERING MECHANICS: STATICS by ANDREW PYTEL, CENGAGE LEARNING
4. ENGINEERING MECHANICS: PRINCIPLES OF STATICS AND DYNAMICS by R. C. HIBBELER, PEARSON



COURSE EVALUATION

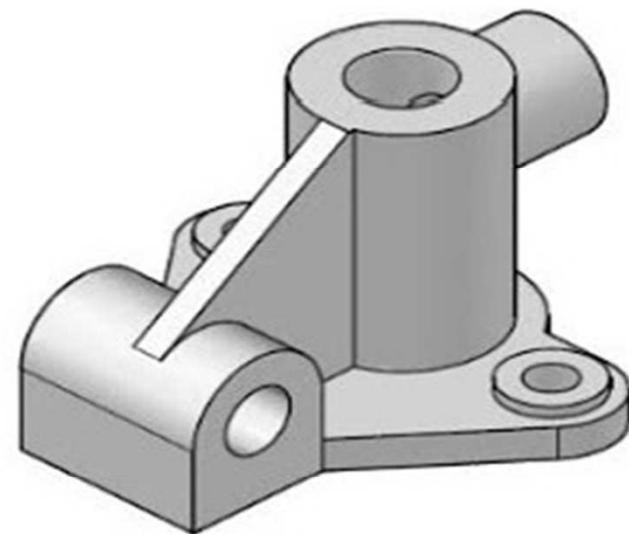
CONTINUOUS ASSESSMENT : 3 (Best 2)	30
MID TERM: 1	25
END TERM: 1	40
ATTENDANCE	5



ENGINEERING DRAWING

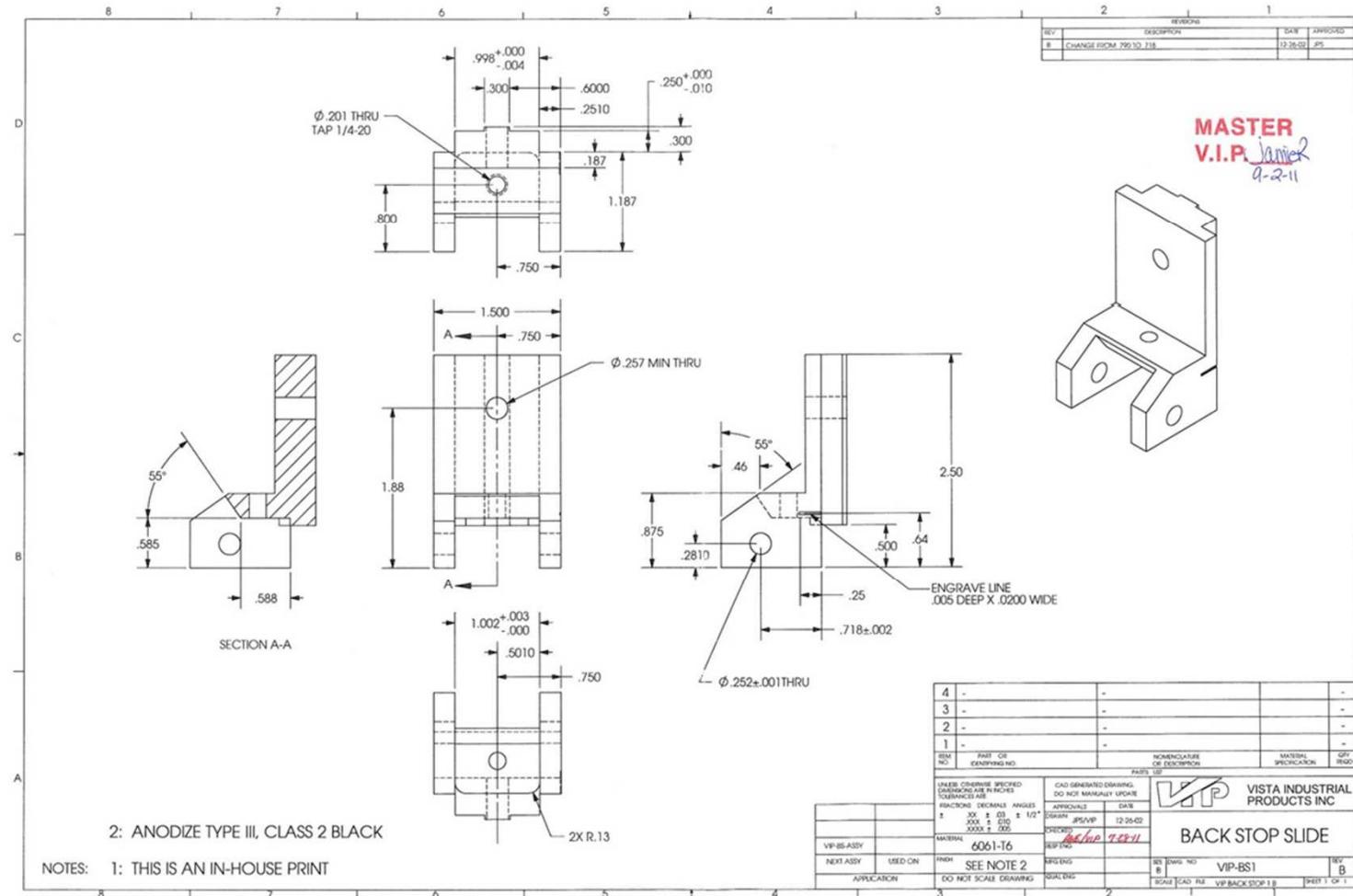
Introduction to Engineering Drawing

The role of engineers is to design & develop products.



Introduction to Engineering Drawing

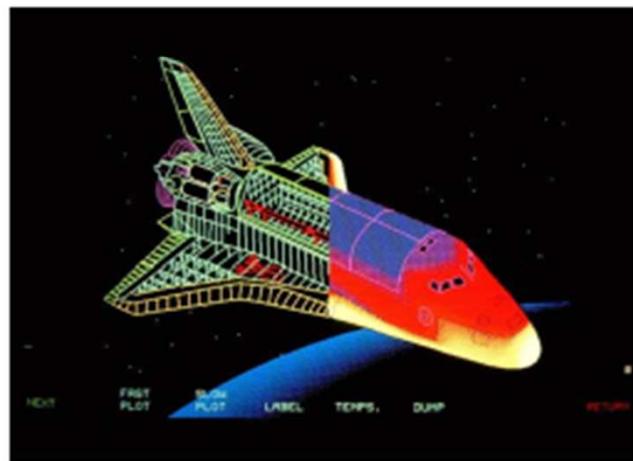
- To communicate their ideas they use engineering drawings.



Introduction to Engineering Drawing

- Engineering drawing is a graphical language used by engineers to communicate their ideas. So it acts as a communication link between designers and manufacturers.
- It is completely different from artistic drawing, which is used to express aesthetic, philosophical and abstract ideas.
- Just as a picture speaks thousands of words, a complete technical drawing tells everything about the geometry of the product.

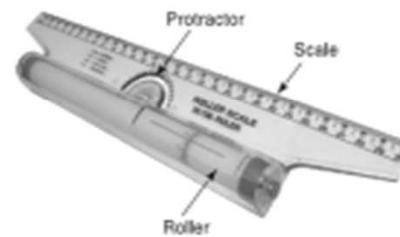
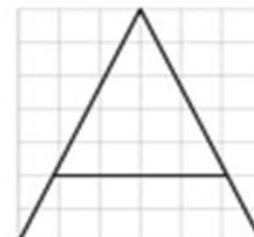
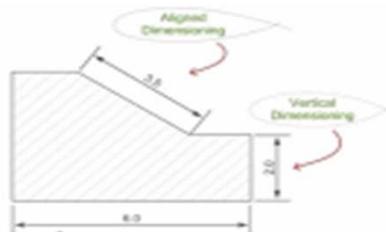
Applications



Syllabus

Unit 1 (Introduction to Engineering Drawing)

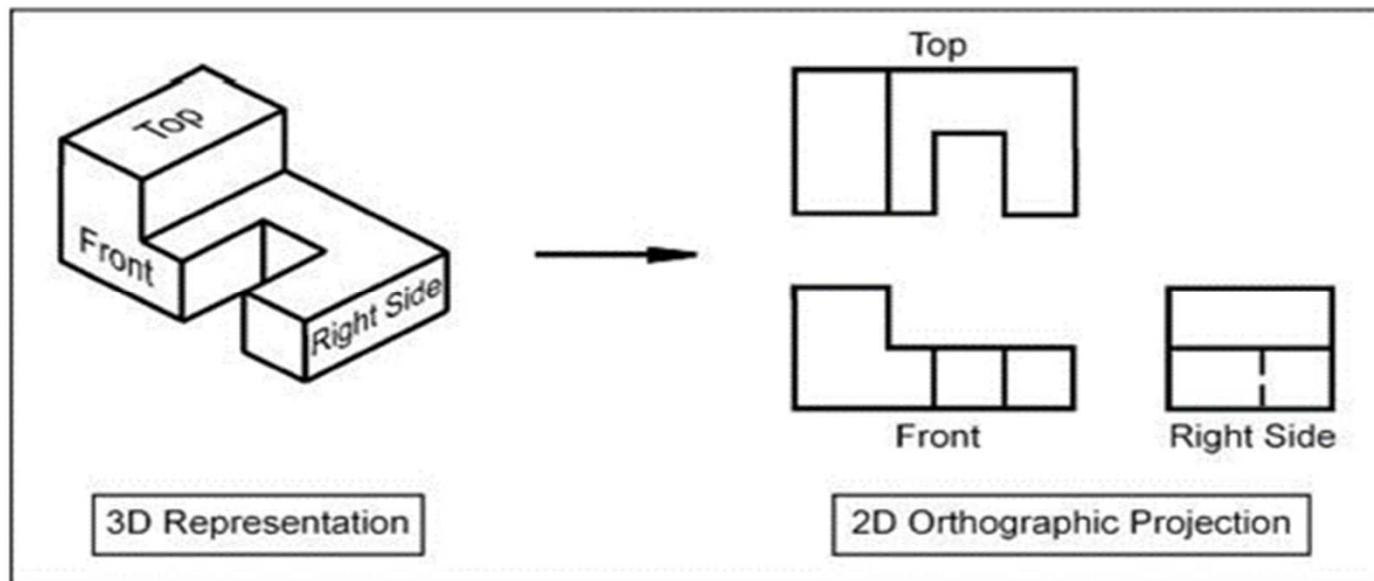
- Principles of Engineering Graphics and their significance.
- Drawing instruments.
- Lettering in vertical Gothic letters using single stroke.
- Dimensioning.
- Different types of lines used in engineering drawing.
- Plane and Diagonal Scale.



Syllabus

Unit 2 (Orthographic Projections)

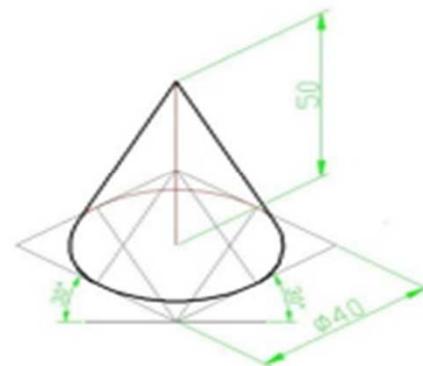
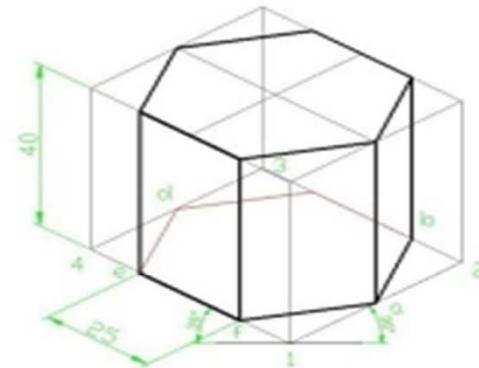
- Methods of obtaining Orthographic Projections (First angle and third angle)
- Principles of orthographic projections.



Syllabus

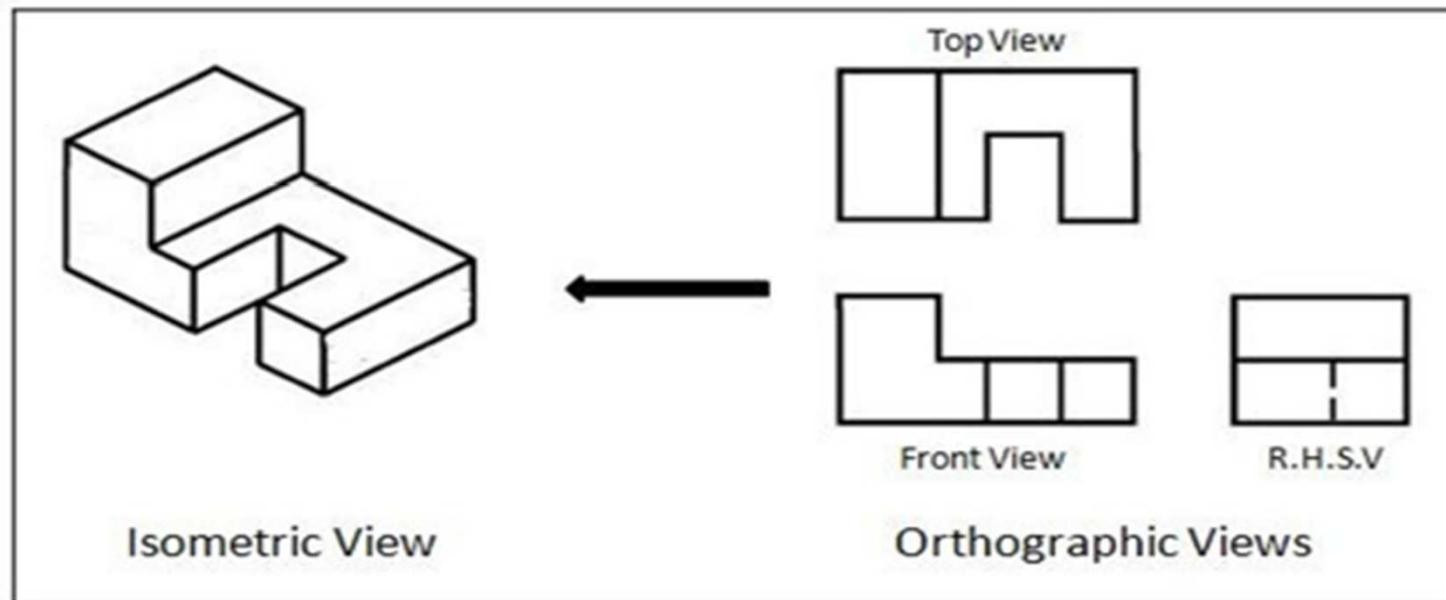
Unit 3 (**Isometric Projections**)

- Isometric Projections.
- Isometric Scale.
- Terminology.
- Isometric Dimensioning.



Syllabus

Unit 3 (Isometric Projections)



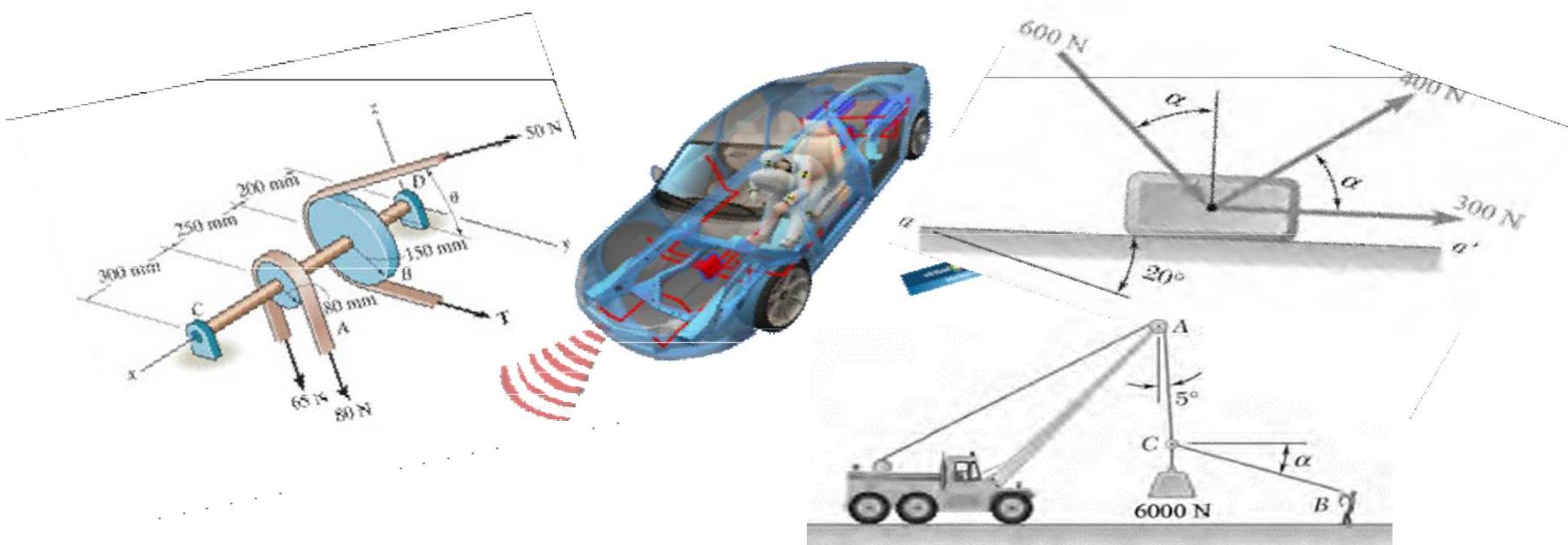


ENGINEERING MECHANICS

Introduction- Engineering Mechanics

For Mechanical Engineers

✓ Basic Course for higher level courses of Mechanical Engineering



Why Engineering Mechanics

Civil Engineers



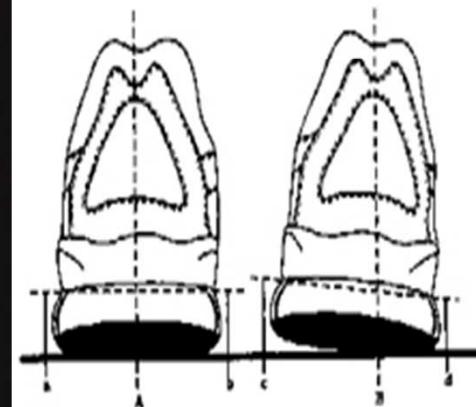
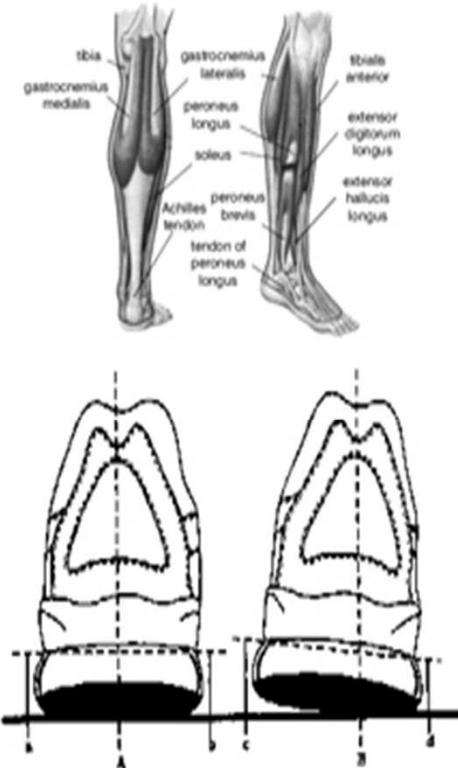
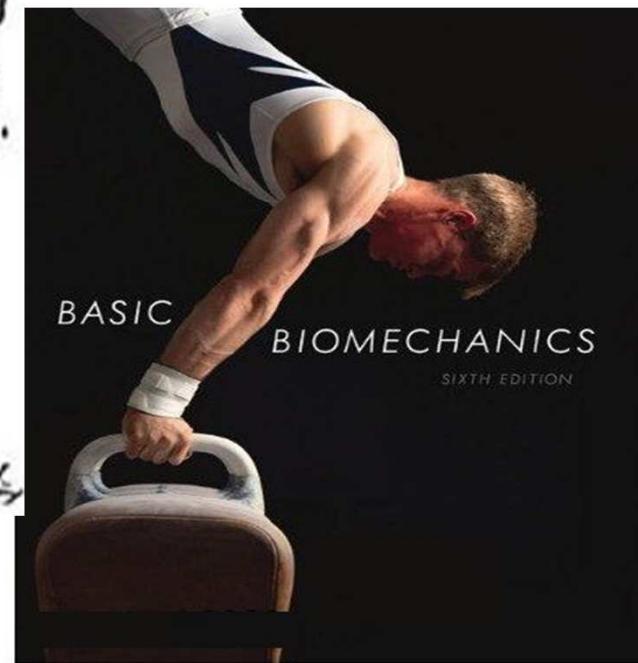
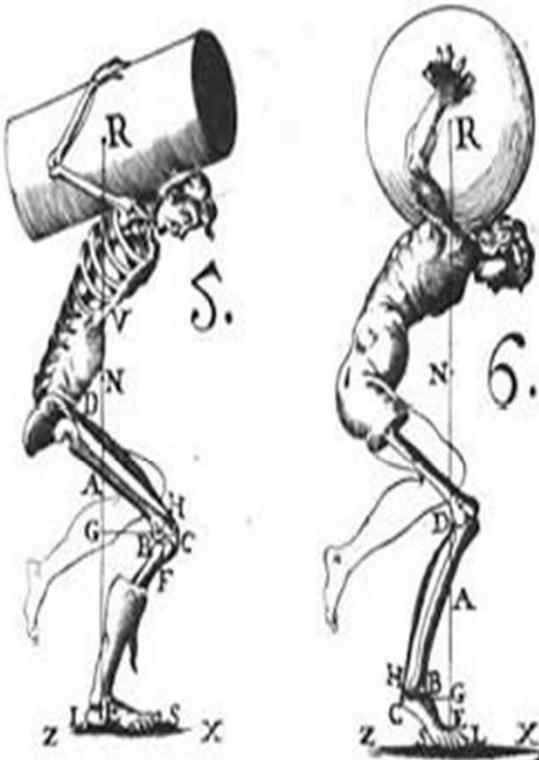
Why Engineering Mechanics

For Electronics Engineers



Why Engineering Mechanics

R BIOTECH ENGINEERS



Why Engineering Mechanics

or Computer Engineers:

- Software Development
- Design of keys, Screens etc. for computers and laptops





SYLLABUS

Unit-4: ANALYSIS OF FORCES

- Concept of Forces
- Moments, Couples and Resultant of Forces
- Equilibrium and Resolution of forces
- Coplanar and Spatial systems

$$\sum F_x = 0$$

$$\sum F_y = 0$$

$$\sum F_z = 0$$

Equilibrium equations

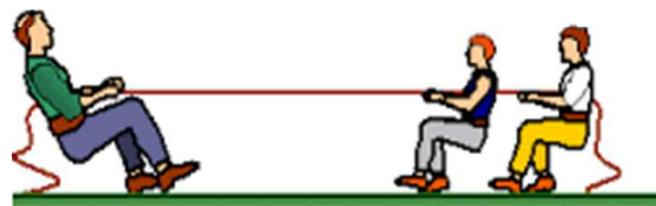
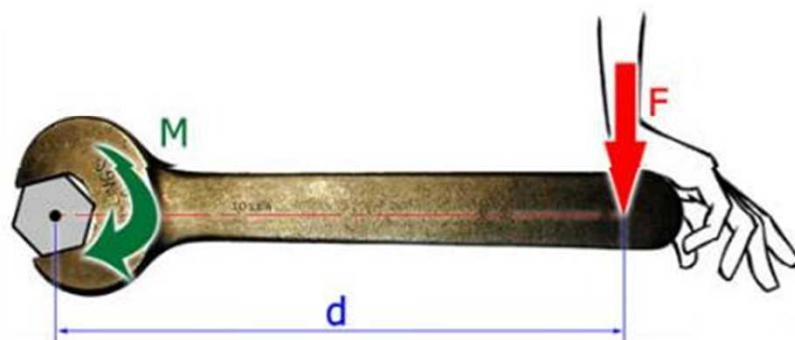
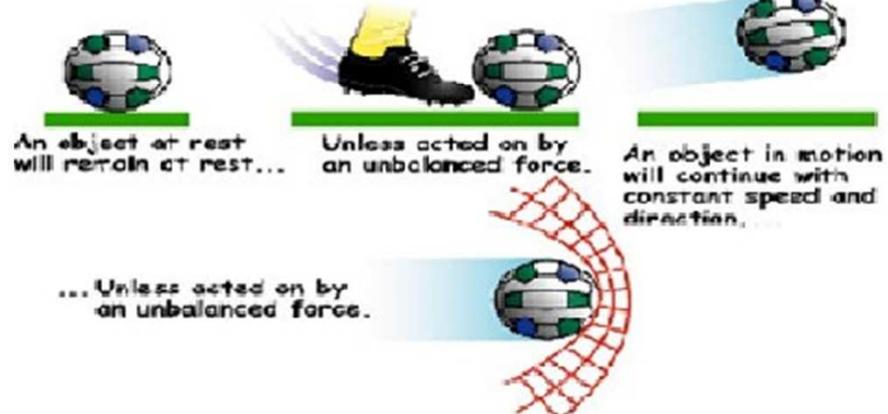


Figure 4

Newton's First Law of Motion



UNIT-5: CENTROID AND CENTER OF GRAVITY

Center of gravity is the average location of the weight of an object

- Centroid of simple figures and composite sections
- Centre of gravity and its implications

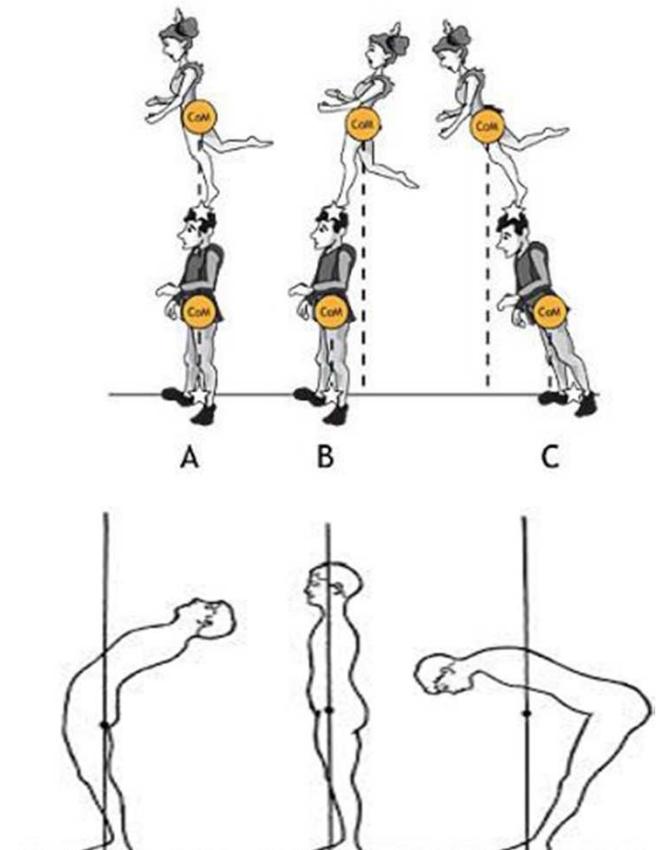
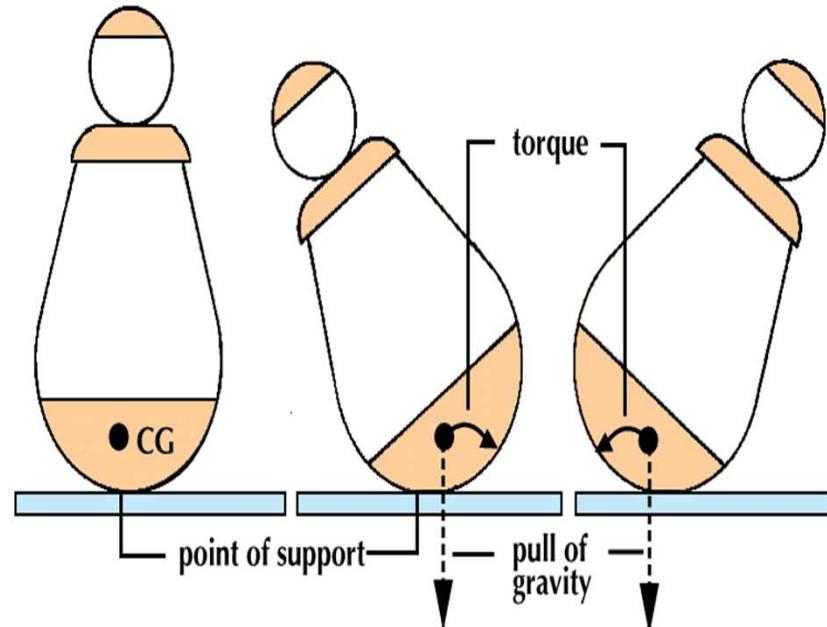


FIG. 11.—Diagrams showing the mechanical reactions of the body whereby the center of gravity is kept over the feet. The center of gravity is indicated by a dot; in the third figure it is outside the body entirely. (Adapted from Schäfer; center of gravity placed according to Lewis and Reynolds.)

UNIT-5: MOMENT OF INERTIA

Object's resistance to rotation and bending

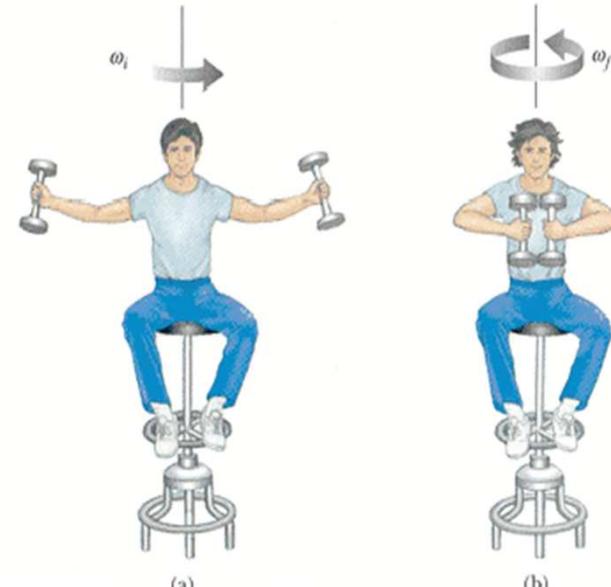
- Moment of Inertia of area (of plane sections)
- MOI of standard and composite sections
- Mass moment of Inertia of different sections



Easier Rotation



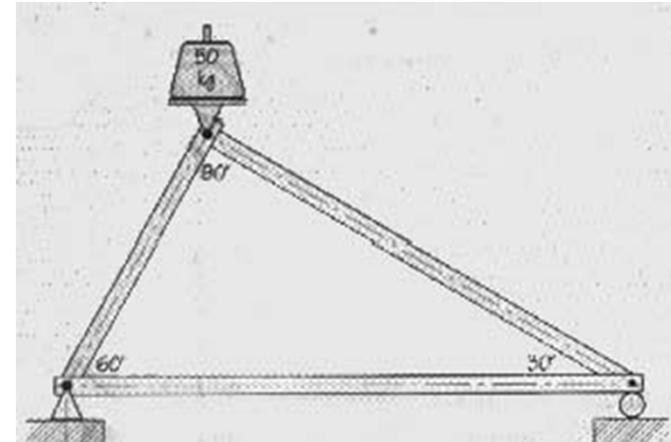
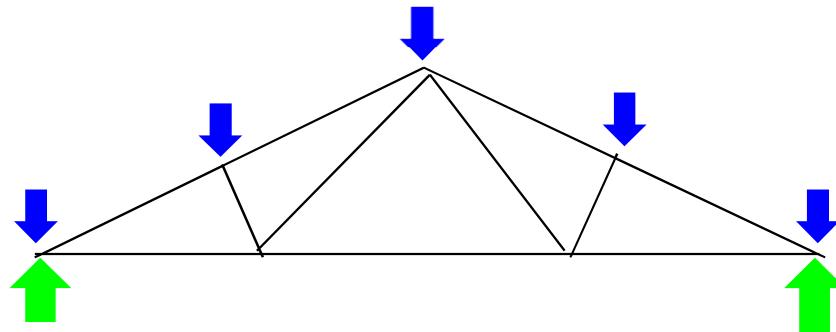
Difficult Rotation



UNIT-6: TRUSSES

PLANE TRUSS

Assembly of linear members,
Connected together to form a triangle or triangles



Two methods

1. Method of Joints
2. Method of Sections



THANKS