RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
OUTCOME BASED CURRICULUM

NAME OF THE PROGRAMME: AUTOMOBILE, MECH, RAC, CHEMICAL, CEMENT, PRODUCTION, OPTHALMIC

Name of Scheme :OCBC -2019 **COURSE CODE: 6805**

COURSE TITLE : APPLIED MECHANICS SEMESTER-I

Applied Mechanics

	COURSE OUTCOMES	CL	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	Describe forces, couples, moments, centre of gravity, work, power and energy	R/U	3	3	3	2	2	1	2
	Calculate resultant force, moment and centre of gravity	A	3	3	2	3	1	1	2
	Calculate efficiency of simple lifting machines	A	3	3	2	3	1	1	2
	Discuss motion of particle and laws of motion	R/U	3	3	2	3	1	1	2
	Conceptualize friction and its laws	R/U	3	3	2	3	1	1	2

CONTENTS

Unit -1 **Force:**	1.1 Fundamentals: - Definitions of mechanics, statics, dynamics. Engineering Mechanics, body, rigid body, mass, weight, length, time, scalar and vector, fundamental units, derived units, S.I. units. 1.2 Force: - Definition of a force, unit force, Newton, S.I. unit of a force, representation of a force by vector and by Bow's notation method. Characteristics of a force, effects of a force, principle of transmissibility. 1.3 Resolution of a force: Definition, Method of resolution, Types of component forces, Perpendicular components and Non-perpendicular components.	

	1.4 Moment of a force: - Definition, measurement of moment of a force, S. I. unit, geometrical meaning of moment of a force, classification of moments according to direction of rotation, sign convention, law of moments Varignon's theorem of moment and it's use, couple – definition, S.I. unit, measurement of a couple, properties of couple. 1.5 Force system: - Definition, classification of force system according to plane and line of action 1.6 Composition of Forces: - Definition, Resultant force, methods of composition of forces I – Analytical method – (i) Trigonometric method (law of parallelogram of forces) (ii) Algebraic method (method of resolution), II – Graphical method: - Introduction, space diagram, vector diagram, polar diagram, and funicular polygon. Resultant of concurrent, non-concurrent and parallel force system by analytical and graphical method.	
Unit -2 **Equilibrium**	2.1 Definition, conditions of equilibrium, analytical and graphical conditions of equilibrium for concurrent, non-concurrent and parallel force system. 2.2 Lami's Theorem – statement and explanation, Application of Lami's theorem for solving various engineering problems. 2.3 Equilibrant – Definition, relation between resultant and equilibrant, equilibrant of concurrent and non-concurrent force system. 2.4 Beams – Definition, Types of beams (cantilever, simply supported, overhanging, fixed, continuous), Types of end supports (simple support, fixed, hinged , roller), classification of loads, point load, uniformly distributed load. Reaction's for a simply supported beamonly .	
Unit – 3 Centre of Gravity and	3.1 Centroid: Definition of centroid. Moment of an area about an axis.Centroid of basic geometrical figures such as square, rectangle, triangle, circle, semicircle and quarter	

Friction	circle.Centroid of composite figure. 3.2Center of gravity: Definition, centre of gravity of simple solids such as cylinder, sphere, hemisphere, cone, cube, and rectangular block. Centre of gravity of composite solids. 3.3 Definition of friction, force of friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction, angle of repose and coefficient of friction. Cone of friction, types of friction, laws of friction, advantages and disadvantages of friction. 3.4 Equilibrium of bodies on level plane –external force applied horizontal and inclined up and down. 3.5 Equilibrium of bodies on inclined plane – external forces is applied parallel to the plane, horizontal and incline to inclined plane.	
Unit – 4 SIMPLE LIFTIND MACHINE	4.1 Definitions of simple machine, compound machine , load , effort , mechanical advantage , velocity ratio , input on a machine ,output of a machine ,efficiency of a machine , expression for mechanical advantage , velocity ratio and efficiency of a machine. Ideal machine, ideal effort and ideal load, friction in machines, effort lost in friction and frictional load. 4.2 Law of machine, maximum mechanical advantage and maximum efficiency of a machine, reversibility of a machine, condition for reversibility of a machine, self locking machine. 4.3 Study of simple machines : Simple axle and wheel, differential axle and wheel, single purchase crab, double purchase crab, simple screw jack, pulleys : First, second and third system of pulleys.	
Unit – 5 Effect of force system, Work Power	5.1 Motion of particle - Definition of speed, velocity, acceleration, uniform velocity, uniform acceleration and variable acceleration . Motion under constant acceleration/ retardation (equations of motion) ,Motion under force of gravity ,Concept of relative	

Energy	velocity . Definition of projectile, velocity of projection , angle of projection, time of light, maximum height, horizontal range and their determination. Definition of angular velocity, angular acceleration and angular displacement . Linear angular motion analogy. Relation between linear and angular velocity of a particle moving in a circular path. Motion of rotation under constant angular acceleration 5.2 Laws of motion - Newton's Laws of motion and their applications 5.3 Work, Power and Energy- Definition unit and graphical representation of work. Definition and unit of power and types of engine power and efficiency of an engine.Definition and concept of Impulse.Definition, unit and types of energies.Total energy of a body falling under gravity.	

Contents (Practical)

Skills to be developed:

1 Intellectual Skill:

A. Calculate the forces on given structure

B. Interpret the results

2 Motor Skills:

A. Handle the equipment carefully

B. Draw graph

LIST OF EXPERIMENTS

Verification of law of parallelogram of forces.

Verification of law of polygon of forces

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Verification of laws of moments

Determination of forces in the members of Jib Crane

Determination of Centroid of plane lamina by graphical method

Determination of coefficient of friction for surfaces of different materials on horizontal plane

Determination of coefficient of friction for surfaces of different materials on an inclined plane

Determination of mechanical advantage, velocity ratio and efficiency of the following lifting machines

Simple wheel and axle

Differential wheel axle

Single purchase crab

Double purchase crab

Simple pulley block

Simple screw jack

REFERENCES

1. A text book of Applied Mechanics – R.S. Khurmi , S.C. Chand & Co. , New Delhi
2. Applied Mechanics – I.B. Prasad, Khanna Publishers, New Delhi
3. Applied Mechanics (Hindi) – R.S. Jog, Anand Publishers, Gwalior
4. Applied Mechanics (Hindi) – A.R. Page, Deepak Prakashan, Gwalior
5. अनुप्रयुक्त यांत्रिकी प्रायोगिक भाग सहित – दिलीप गांगिल, संजय पब्लिकेषन्स जयपुर ।