Course Name : Three years Diploma in Mining Engineering
Year : Second
Subject Title : ENGINEERING MECHANICS
Subject Code : M203

Teaching and Examination Scheme:

Teaching Scheme*			Examination Scheme					
L	T	P	Full Marks	External Exam Marks	Internal Exam Marks	External Pas Marks	Total Pass Marks	Duration of External Exams
2	0	0	100	80	20	26	40	3 Hrs.
Sessional (MI215)		2	50	30	20		25	

*Duration of year is considered 28 weeks

Mechanics mainly deals with problems connected with motion or equilibrium of material and bodies and resulting interaction between them. Its purview come varieties of general and specialized engineering discipline connected with mining structures, machine mechanism or their parts.

Basic understanding of the concept and principles involved in mechanics is essential. Application of the principles to engineering situation relevant to mining should be emphasized.

COURSE OUTCOMES:

After undergoing the course of study the student shall be able to

1. Understand the concept and principles of machines.
2. Apply the principles to solve engineering problems.

Unit	Content	Contact Hours	Marks
1.	**Basic Concept** Introduction of Engineering Mechanics, Rigid bodies, Basic and derived units, Kinetics and Kinematics, Scalar and Vector quantities, System of units, International system of units.		
2.	**Force, Resolution & composition of forces** 2.1 Definition of force, unit of force, Effect of force,		

	Absolute and gravitational unit, characteristics of a force, System of forces, Coplanar and on Coplanar forces, concurrent and non-concurrent forces, parallel forces. **2.2 Laws of forces, parallelogram law of forces, triangle laws of forces, law of polygon of forces, principles of physical impedence of forces, Principle of transmissibility.** **2.3 Composition of forces, Resolution of forces, forces acting in various quadrants.** **2.4 Definition of moments and its units in S.I. system, Types of moments, Definition of Couple, Types of Couple, Varignon's theorem of moments, Resultant & Equilibrant force.**		
3.	**Equilibrium** **3.1 Definition of Equilibrium Laws of Equilibrium, Analytical condition of equilibrium, Graphical conditions of equilibrium, Finding reaction of simply supported, overhang beams graphically, Free body diagrams, equilibrium of parallel forces & non parallel forces.** **3.2 Lami's Theorem and its application** **3.3 Beam reactions –Definition of beam, span. Types of beams, simply supported beam carrying concentrated loads and uniformly distributed loads.**		
4.	**Friction** **4.1 Concept of friction, Importance of friction in engineering. Useful and harmful effects of friction, Types of friction, Laws of friction, Limiting Equilibrium, Limiting friction, Coefficient of friction, Angle of friction, Angle of repose, Relation between co-efficient of friction and Angle of friction.** **4.2 Equilibrium of bodies on level surface, Inclined plane with external forces acting in various directions. (Numerical)**		
5.	**Centroid and Center of Gravity** **5.1 Introduction, Difference between centroid and center of gravity, Method of finding out Centroid and center of gravity of regular figures such as Triangle, Rectangle, Circle, Semicircle, Trapezoidal.** **5.2 Center of gravity Solids, Sphere, Hemisphere, Cone, Frustum of cone, Pyramid Cylinder and hollow Solids.**		
6.	**Simple Lifting Machines** **8.1 Concept of machine, Definition of load, Effort,**		

	Mechanical advantage, Velocity ratio, Input of machines, Output of machine. Efficiency of machine, Reversible and non-reversible machine. **8.2 Ideal machine, Friction in machine, law of machine, maximum mechanical advantage, Maximum Efficiency.**		
7.	**Transmission of power by Belt and Rope** **9.1 Types of belts, Velocity ratio, Follower, driver, slip.** **9.2 Friction in belt, ratio of tension in belt, power transmitted by belt & ropes.** **9.3**		
8.	**Strength oh materials.** **10.1 Concept of elastic, plastic and rigid bodies.** **10.2 Concept of axial loads, axial stresses (Compressive & tensile), axial strains, lateral strain, piossons ratio, volumetric strain, Composite section under axial load, modular ratio. Concept of bi axial &triaxial stresses. Definition of bulk modulus. Concept of temperature stresses.** **10.3 Elastic constants, concept of shear load, shear stresses & shear strain, modulus of rigidity, relation between 'E', 'C' and 'K'.**		
9.	**Moment of Inertia.** **11.1. Concept of moment of inertia, moment of inertia for plane areas such as rectangle, triangle , circle, semicircle and quarter circle.** **11.2. Parallel axis and perpendicular axis theorem, moment of inertia of composite sections.**		
10.	**Shear force & bending moment.** **12.1. Concept of shear force and bending moment.Definition sign convention. Relation between bending moment, shear force and rate of loading.** **12.2. Shear force & bending moment diagrams for simply supported beams, overhanging beams, and cantilever beams subjected to point loads and uniformly distributed loads, point of contraflecture.**		

SESSIONAL WORK:

1. **Verification of Law of Polygon of forces.**
2. **Study of forces in the members of JIB-CRANE.**
3. **Verification of Lami's theorem.**

4. **Verification of Equilibrium of parallel forces on beam.**
5. **Comparison of Co-efficient of friction between different surfaces.**
6. **Simple Wheel and Axle.**
7. **Differential Axle and Wheel.**
8. **Simple Screw jack.**
9. **Two sheave and three sheave pulley block.**
10. **Single Purchase Crab.**
11. **Double Purchase Crab.**
12. **Worm and Worm wheel**
13. **Study of U.T.M.**
14. **Tension test on mild steel.**
15. **Drawing S.F. D. & B.M.D. for six problems (Simply supported & cantilever beams with different types of loading). On A2 size drawing sheet.**

STRATEGY OF IMPLEMENTATION:

Conducting theory classes, practical, Industrial visits, seminars, group discussion, and assignment on different topics shall complete the curriculum for the subject.

REFERENCE BOOKS:

Author	Title	Publisher
Khurmi	Strength of materials.	New delfi S. Chand & Co.
Timoshenko & Young	Engg Mechanics	New york: Mcgraw Hills.
Singer	Engineering Mechanics	London: Harper & Row.
Ramanutham	Applied Mechanics	Delhi: DhanpatRai& Sons.
Timo Sanko	Applied Mechanics	