NATIONAL INSTITUTE OF TECHNOLOGY–MIZORAM

DEPARTMENT OF MECHANICAL ENGINEERING

1st Semester B.Tech

MEL-1101 ENGINEERING MECHANICS

L-T-P: 3-1-0 **Credits: 6**

PART-I: STATICS

1. Review of Basic Concepts of Mechanics- Statics:

Introduction to mechanics; Basic concepts – mass, space, time and force; Particles and rigid bodies; Scalars and vectors; Free, sliding, fixed and unit vectors; Addition, subtraction and multiplication of two vector; Definition of a force; Classification of forces; Principle of transmissibility.

Introduction to different force systems; Composition of forces – triangle, parallelogram and polygon law of forces, and addition of two parallel forces; Resolution of forces; Moment of a force, Varignon's theorem; Couple of forces; Force-couple system; Resultant of a force system. **Lectures 06**

2. Two and three-dimensional force systems: Force, moment, couple system, Resultant with engineering application. **Lectures 04**

3. Equilibrium condition for a force system: Free body diagram, different type of support reaction with engineering application. **Lectures 04**

4. Concentrated and distributed loading on a beam: Shear force and bending moment diagrams. **Lectures 02**

5. Structures: Plane trusses, Method of joints, Method of sections, Frames and Machines. **Lectures 06**

6. Dry friction-Review of law of friction: Laws of dry friction; Co-efficient of friction; Angle and cone of friction; Angle of repose; Applications of friction—wedges, screw-jacks, bearing, pulleys. **Lectures 03**

7. Virtual work: Work done by forces and couples; Virtual displacement and virtual work; Principle of virtual work for equilibrium bodies; Active force diagram; Degree of freedom. **Lectures 04**

PART-II DYNAMICS

1. **Review of Basic Concepts of Mechanics- Dynamics:** Introduction, Basic concepts-Effect of altitude, effect of a rotating earth, apparent weight. **Lectures 02**
2. **Kinematics of Particles**: Differential equations of kinematics – plane, rectilinear and curvilinear motions; Cartesian co-ordinate system; Normal and tangent co-ordinate system, projectile motion. **Lectures 03**

3. **Kinetics of Particles**: Newton's second law of motion; Work and energy principle in engineering application– gravitational potential energy, elastic potential energy, kinetic energy, power, efficiency; Principle of impulse and momentum; Impact motion- direct central impact. **Lectures 04**
4. **Dynamics of Rigid Bodies**: Kinematics of rotation; Kinetics of rotation- equation of motion, principle of work and energy; Principle of impulse and momentum. Plane Motion of Rigid Bodies Translation of a rigid body in a plane; Kinematics of plane motion; Instantaneous centre of rotation; Kinetics of plane motion – equation of motion, principle of work and energy; Principle of impulse and momentum, Gyroscopic motion.

Lectures 04

Total Lectures: 42 Hrs

MEP-1101 ENGINEERING MECHANICS LABORATORY

L-T-P: 0-0-2 **Credits: 2**

- Determination of centre of gravity (C.G)
- Verification of Lami's Theorem
- Proving the law of polygon of Forces
- Analysis of shear leg structure
- Determination of coefficient of static friction.
- Use of programming language for solving static type problem
- Use of programming language for solving dynamic type problem

Text Books:

1. Engineering Mechanics - K. L. Kumar
2. Engineering Mechanics Statics - J.L.Meriam & L.G.Kraige
3. Engineering Mechanics Dynamics - J.L.Meriam & L.G.Kraige
4. Engineering Mechanics - S.Timoshenko and D.H.Young

Reference Books:

1. Vector Mechanics for Engineers Statics - F. P. Beer & E. R. Johnston
2. Vector Mechanics for Engineers Dynamics - F. P. Beer & E. R. Johnston
3. Engineering Mechanics Statics - R.C. Hibbeler
4. Engineering Mechanics Dynamcs - R.C. Hibbeler

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MEP-1202 MECHANICAL WORKSHOP

L-T-P: 0-0-2 **Credits: 2**

1. General safety precautions in workshop and introduction. **Lectures 01**

2. **Carpentry Shop**: - **Lectures 08**

Safety precaution, Kinds of wood and timber, Application of timber as per their classification, Carpentry hand tools and machines, Demonstration of wood working machine like, band saw, circular saw, thickness planner, wood working lathe, surface planners etc.
Exercise: Different types of carpentry joint.

3. **Welding Shop: -** **Lectures 06**

Introduction study and use of welding tools and devices. Study of electric arc welding/gas welding machine job making (i) Lap Joint (ii) Other joints
Exercise: A simple job on gas/arc welding.

4. **Fitting Shop**: - **Lectures 06**

Safety precaution, Introduction to fitting shop tools, equipment, Operation and their uses, Marking and measuring practice.
Exercise: A simple job using fitting tools and equipment.

5. **Turning and Machine Shop**: - **Lectures 06**

Safety precautions, Demonstration and working principles of some of the general machines, like lathe, shaper, milling, drilling, grinding, slotting etc. General idea of cutting tools of the machines.
Exercise: A simple job on lathe/ shaper.

6. Sheet Metal Shop: - **Lectures 05**

Introduction, study and use of various tools, soldering and brazing job making- conical funnel.

Text Book:

1. Workshop Technology - Hazra Chaudhary
2. Workshop Technology - Raghubansi
3. Manual on Worshop Practice - Kannaiah
4. Workshop manual -Kannaiah

NATIONAL INSTITUTE OF TECHNOLOGY–MIZORAM

DEPARTMENT OF MECHANICAL ENGINEERING

2st Semester B.Tech

MEL-1202 ENGINEERING DRAWING

L-T-P: 2-0-4 **Credits: 8**

1. **Introduction** **(lecture-2)**
   - Introduction to engineering drawing
   - General instruction
   - Lines
   - Lettering
   - Dimensioning and freehand sketch.
2. **Geometrical construction** **(lecture-2)**
   - Bisecting a line, arc and angle
   - Dividing straight line in to equal number of parts
   - Tangents to lines and arcs
   - Construction of pentagon, hexagon and octagon
   - Inscribing circles inside regular polygons, etc.
3. **Scale** **(lecture-2)**
   - Plane and Diagonal
4. **Conic Sections** **(Lecture-4)**
   - Type of conic surface.
   - Method of construction of ellipse.
   - Method of construction of parabola
   - Method of construction of hyperbola.
5. **Engineering curve** **(lecture-4)**
   - Cycloidal cycle
   - Cycloid
   - Epicycloid
   - Involute
   - Logarithmic Spiral
6. **Projection of point** **(lecture-3)**
   - Points in 1^{st}, 2^{nd}, 3^{rd} and 4^{th} quadrants.
7. **Projection of straight line** **(lecture-4)**
   - Line parallel to both the reference planes.
   - Line perpendicular to one reference plane and parallel to the other.
   - Line inclined to one reference plane and parallel to the other.
   - Line inclined to both the reference planes.

- True length and inclination.
- Traces of lines.

8. Projection of plane (lecture-6)

- Plane perpendicular to both the reference planes.
- Plane perpendicular to one reference plane and parallel to the other.
- Plane inclined to one reference plane and perpendicular to the other.
- Plane inclined to both the reference plane.

9. Projection of solids (lecture-6)

- Axis of solid parallel to both the reference planes.
- Axis of solid perpendicular to one reference plane and parallel to the other.
- Axis of solid inclined to both the reference planes.

10. Sections of solids (lecture-5)

- Section of solids with axis of the solids perpendicular to one reference plane and parallel to the other and the plane sectioning the solid is perpendicular to one reference plane and parallel to the other.
- Section of solids (true and apparent shape of section) with axis of the solids inclined to one reference plane and perpendicular to the other and the plane sectioning the solid is perpendicular to one reference plane and parallel to the other.
- Section of solids (true and apparent shape of section) with axis of the solids inclined to one reference plane and perpendicular to the other and the plane sectioning the solid is inclined to one reference plane and perpendicular to the other.

11. Development of surface (lecture-3)

- The principle of development of surfaces.
- Methods for drawing the development of surfaces.

12. Orthographic projection (lecture-5)

- Orthographic projection of different types of simple objects.
- Sectional view of different types of simple objects

13. Isometric projection (lecture-3)

- Principle of isometric projection
- Isometric scale
- Produce for drawing isometric projection.
- Isometric projection and isometric view

14. Introduction to computer aided drawing (lecture-2)

Total Lecture: 51 hrs

Text Book

1. Engineering Drawing- ND Bhatt
1. Engineering Drawing- A.G Agarwal
2. Engineering Drawing- R.B Gupta