

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

**APPLIED MECHANICS
(Code: 3300008)**

Diploma Programme in which this course is offered	Semester in which offered
Aeronautical Engineering	Second

1. RATIONALE.

Applied mechanics, as its name suggests, bridges the gap between physical theory and its application to technology. As such, applied mechanics is used in many fields of engineering, especially mechanical and Metallurgy Engineering. In this context, it is commonly referred to as engineering mechanics. To impart basic knowledge of Engineering Mechanics where in Laws of Physics are applied to Solve Engineering problems, this programme / course will help the student to develop basic know how & awareness of the various laws of physics & it's real life applications in the various fields of engineering

2. COMPETENCY.

The course content leading to the achievement of the following competencies;

- i. **Apply the concepts of force, work and energy to calculate work done, power required & efficiency for various simple machines**

3. TEACHING AND EXAMINATION SCHEME.

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
03	00	02	05	70	30	20	30	

Legends:L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P -Practical; C – Credit,ESE - End Semester Examination; PA - Progressive Assessment.

4. COURSE DETAILS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit-I Introduction	1.1 Define scope of Engineering Mechanics 1.2 Classify Scalar & Vector quantity 1.3 Differentiate the systems of Units	Scalar & Vector Quantities – like force, pressure, velocity, acceleration Static & Dynamic – Kinetics & Kinematics MKS, CGS & SI units and its conversion along with FPS and Metric System
Unit-II Coplanar Concurrent Forces	2.1 Understand Co-planar Concurrent Forces system 2.2 Compute resultant & Equilibrium forces for given coplanar concurrent forces system	Force – units, elements, Laws/Principles of forces such as Principle of Superposition, Principle of transmissibility Composition & Resolution of Forces Resultant & Equilibrium forces conditions of equilibrium Analytical & graphical method for Law of Parallelogram, Law of Triangle, Lami's Lami's Theorem, Law of Polygon
Unit-III Coplanar Non-Concurrent Forces	3.1 Differentiate Co-planar parallel and non-concurrent forces 3.2 Compute resultant & Equilibrium forces for given coplanar concurrent force system 3.3 Calculate Support reactions of the given simply supported	Principle of Moment Moment, Couple, application, properties of couple, conditions of equilibrium Types of supports , end conditions – Hinge, free end, roller, fix, Types of loads like point load, U.D.L, U.V.L, Couple, Analytical method to Evaluate reactions in statically determinate beams subjected to point load and/or U.D.L by analytical method of solving Statically determinate beams.
Unit-IV Centroid & Centre of Gravity	4.1 Distinguish between Centroid and Centre of Gravity 4.2 Compute Centroid & Centre of gravity in different shapes and lamina	First moment of area ; to find Centroid – standard shapes of I, L, Channel & T sections, axis of symmetry First moment of mass ; to find C.G of standard solids sections, Axis of symmetry
Unit-V Friction	5.1 Appreciate Friction and its Engineering applications 5.2 Calculate coefficient of friction for different surfaces	Friction , Laws of Friction, Angle of Friction, Angle of Repose, types of friction Application of Lami's theory and theory of resolution of forces, examples on friction for a block resting on horizontal plane & on inclined plane
Unit-VI Work, Power & Energy	6.1 Establish relation between Work, Power Energy 6.2 Calculate IHP and BHP in different conditions	Work – work done, forced displacement diagram, torque, work done by torque Power – I.H.P and B.H.P of engine, Equation of H.P in terms of Torque and R.P.M, Engineering Problems Energy – Kinetic & Potential energy and Engineering Problems

Unit-VII Simple Machines	7.1 Apply the principle & application of Simple Machines 7.2 Compare reversible & irreversible Machines, evaluate the efficiencies of various simple machines	principles of machines to evaluate Mechanical Advantage, Velocity Ratio of simple machine pulley blocks , Draw Linesketch of different systems of Simple and compound levers , Problems, Laws of Machines, reversible & non-reversible machines
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5. SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY).

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Introduction	02	04	00	00	04
2.	Coplanar Concurrent Forces	10	02	02	06	12
3.	Coplanar Non-Concurrent Forces	10	02	02	08	12
4.	Centroid and Centre of Gravity	04	02	02	06	10
5.	Friction	06	02	04	06	12
6.	Work, Power & Energy	04	02	02	06	10
7.	Simple Machines	06	02	02	08	12
	Total	42	16	14	40	70

Legends: R = Remember U = Understand; A = Apply and above levels (Bloom's revised taxonomy).

6. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the list of Exercises/practical/experiments for guidance.

Sr. No.	Unit No.	Practical Exercise/Experiment
1	01	----
2	02	Verify and calculate resultant force through Law of Parallelogram, Polygon Law of Forces, Lami's Theorem
3	03	Verify reactions in beam through Graphical & analytical method
4	04	Calculate Centroid of lamina and Centroid of different sections
5	05	Calculate Coefficient of Sliding Friction for different surfaces - Wood, Glass
6	06	----
7	07	Work-out M.A. & Efficiency of Simple purchase crab, simple wheel and axle, simple screwjack

7. SUGGESTED LIST OF STUDENT ACTIVITIES

- 7.1 Students will prepare File/journal for the above mentioned Experiments.
- 7.2 Students may be given few exercises to calculate resultant/equilibrium force of the force system graphically & analytically verify the results. -unit 2
- 7.3 Student may be asked to collect photographs from internet which is related to field application of various topics

8. SUGGESTED LEARNING ACTIVITIES

A. List of Books

Sr. No.	Title of Book	Author	Publication
1.	Engineering Mechanics	RS Khurmi	S. Chand, New Delhi
2.	Engineering Mechanics	DS Kumar	S. K. Kataria & Sons,
3.	Engineering Mechanics	Bear & Jonstan	Newmedia
4.	Applied Mechanics	HJ Shah & Junarkar	CHAROTAR Publication

B. List of Major Equipment/Instrument

- Apparatus for Law of Parallelogram, Lami's theorem & law of Polygon
- Apparatus for determination of coefficient of friction
- Apparatus to determine CG of Lamina
- Beam apparatus to find reactions
- Simple purchase crab, simple wheel and axle, simple screw jack

C. List of Software/Learning Websites

- Video Lectures on Applied Mechanics By Prof. SK. Gupta, Department of Applied Mechanics, IIT Delhi
- www.tut.fi/.../InstituteofAppliedMechanicsandOptiization/TME-51
- ocw.mit.edu>...>MechanicsofMaterials
- www.me.ust.hk/.../ME106-applied%20mechanics-lecture%201.pdf

COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from

Co-coordinator and Faculty Members from NITTTR Bhopal