GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Applied Mechanics
(Code: 3300008)

Diploma Programmes in which this course is offered	Semester in which offered
Automobile Engineering, Metallurgy Engineering	**First Semester**
Civil Engineering, Environment Engineering, Fabrication Technology, Mechanical Engineering, Mechatronics Engineering, Mining Engineering, Transportation Engineering	**Second Semester**

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. LIST OF COMPETENCIES

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				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	150
3	0	2	5	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. DETAILED COURSE CONTENT

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I **Introduction**	1.1Define scope of Engineering Mechanics 1.2 Classify Scalar & Vector quantity 1.3Diffrentiate 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 FPI and Metric System
Unit– II **Coplanar Concurrent Forces**	2.1Understand Co - planer Concurrent Force system 2.2Compute resultant & Equilibrium forces for given coplanar concurrent force system	**Force** – units , elements , **Laws/Principles** of forces such as Principle of Superposition ,Principle of transmissibility Composition & Resolution of Forces **Resultant & Equilbrium** forces conditions of equilibrium **Analytical & graphical method** for Law of Parallelogram , Law of Triangle , Lami's Theorems , Law of Polygon
Unit– III **Coplanar Non-Concurrent Forces**	3.1Differentiate Co-planar , parallel and non - concurrent forces 3.2Compute resultant & Equilibrium forces for given coplanar concurrent force system 3.3 Calculate Support reactions of the given simply supported beam	**Principal 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 beam subjected to point load and/ or U.D.L by analytical method of solving Statically determinate beams to
Unit – IV **Centroid & Centre of Gravity**	4.1Distinguish between Centroid and Centre of Gravity 4.2Compute Centroid & centre of gravity in different shape 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**	5.1Appreciate Friction and its Engineering applications 5.2Calculate 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**	6.1Establish relation between Work, Power Energy 6.2Calculate IHP and BHP in different conditions	**Work** – work done , force 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 **Energ**y – Kinetic & Potential energy and Engineering Problems
Unit – VII **Simple Machines**	7.1Apply 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 Line sketch of different systems of **Simple and compound levers** ,Problems , Laws of Machines , reversible & non reversible machines

5. SUGGESTED SPECIFICATION TABLE WITH HOURS & 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 = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxomonoy

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.

S. 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 Co efficient 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 screw jack

7. SUGGESTED LIST OF STUDENT ACTIVITIES

7.1 Students will prepare File/journal for the above mentioned Experiments.

7.2Students 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	R S Khurmi	S. Chand , New Delhi
2.	Engineering Mechanics	D S Kumar	S. K. Kataria & Sons,
3.	Engineering Mechanics 7th edition	Bear & Jonstan	New media
4.	Applied Mechanics	H J Shah & Junarkar	CHAROTAR Publication

B. List of Major Equipment/ Instrument

7.4 Apparatus for Law of Parallelogram , Lami's theorem & law of Polygon

7.5 Apparatus for determination of coefficient of friction

7.6 Apparatus to determine CG of Lamina

7.7 Beam apparatus to find reactions

7.8 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/.../InstituteofAppliedMechanicsandOptimization/TME-51

ocw.mit.edu › ... › Mechanics of Materials

www.me.ust.hk/.../ME106-applied%20mechanics-lecture%201.pdf

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. B G RAJGOR** , HOD , Dept of Applied Mechanics, B & B Institute of Technology
- **Prof. J H GABRA** , I/C HOD , Dept of Applied Mechanics, G.P , Godhara

Co-ordinator and Faculty Members from NITTTR Bhopal

- **Dr. J.P.Tegar**, Professor Dept. of Civil and Environmental Engg, NITTTR, Bhopal.