3rd Semester Mechanical Engineering

Subject Title : Strength of Materials

Subject Code: MEC306

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	Th Fin	Th Internal	Pr	TOTAL
03	--	02	03	100	80	20	50	150

Rationale:

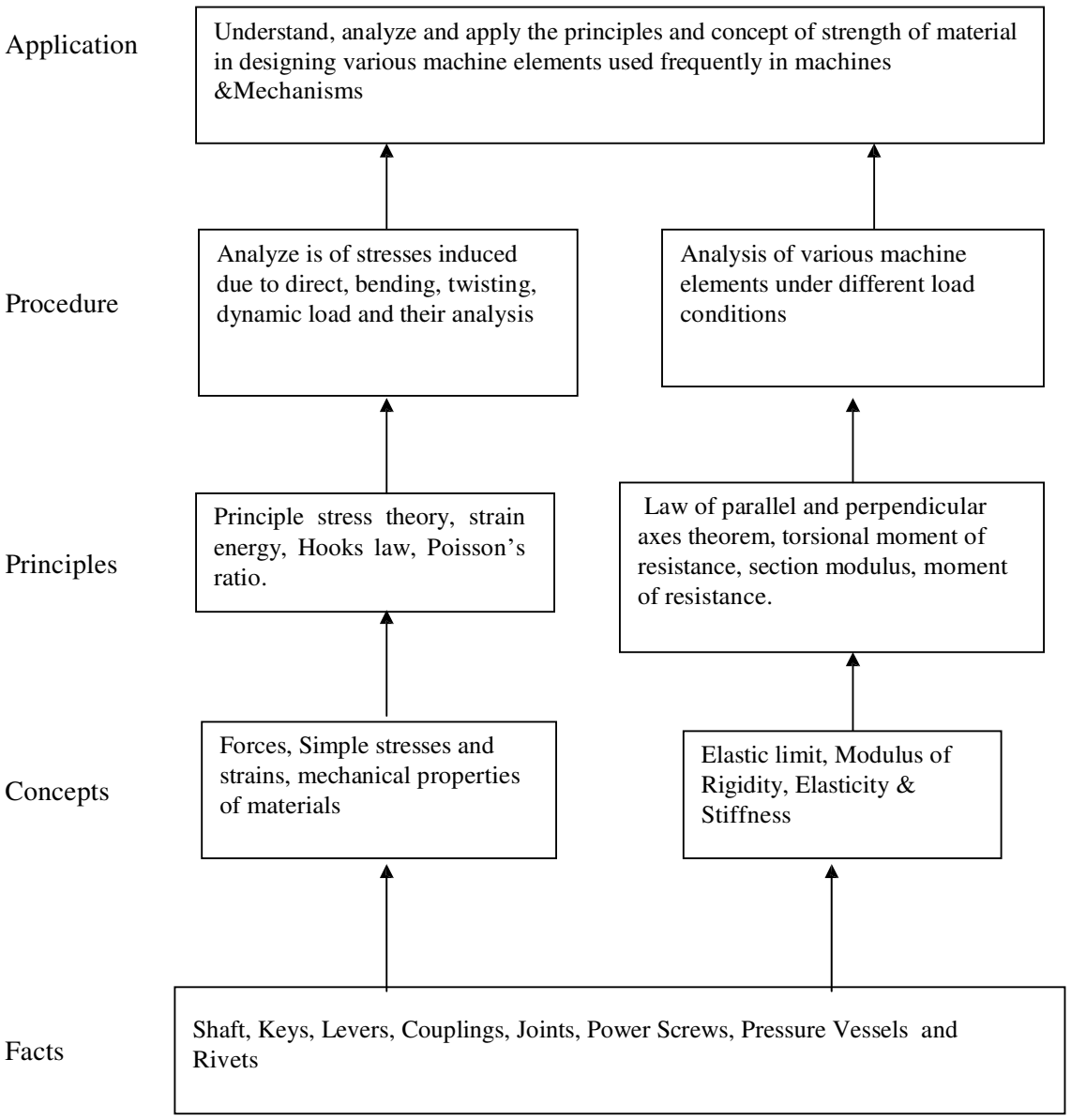
Strength of Material is a core technology subject. It aim sat enabling the student to understand & analyze various types of loads, stresses & strains along with main causes of failure of machine parts. The subject is pre-requisite for understanding principles of machine design. Understanding mechanical properties of materials will help in selecting the suitable materials for various engineering applications.

Objectives:

The Student should be able to:

1. Understand the fundamentals of solid mechanics.
2. Acquire elementary knowledge of stresses, strains & material properties.
3. Understand&analyzethebasicprinciplesinvolvedinthebehaviorofmachinepartsunderloadin the context of design in gait.
4. Understand& analyze the mechanical properties of the various materials.

Learning Structure:



Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	**Mechanical Properties of Materials, Simple stresses & Strains** 1.1 Mechanical properties– Elasticity, Plasticity, Rigidity, Ductility, Malleability, Toughness, Hardness, Brittleness, Creep, Fatigue. 1.2 Concept & Definition of Simple stresses &strains Types - tensile,compressive,Shear,single&doubleshear,Punchingshear,Hooke'slaw,Young'smodulus,ModulusofRigidity,Changeinlengthofthebarhavinguniform&steppedcrosssection stress-straincurvesforductile&brittlematerials. 1.3 Volumetric Strain, Bulk modulus, Poisson's ratio. Bi-Axial &Tri-axial stresses & strains. Relationship among E,G,&K. 1.4 Stresses & strains in bar so uniformly varying section subjected to axial load attend sonly, Composite sections having same length. 1.5 Temperatures tresses & strains of uniform & ***composite*** Sections. 1.6 Buckling of long columns 'Euler's theory, Rankin's theory – equivalent length of the column for the cases of Both ends hinged, One end fixed and other free, Both ends fixed, One end fixed and other end hinged. (simple numerical only)	8	
02	**Bending Moment & Shear Force** 2.1 Concept & definition of Shear force & bending moment. Relation between rate of loading, shear force & bending moment. 2.2 Shear force & bending moment diagrams for cantilevers, simply supported beam & over hanging be am subjected to point loads, Uniformly distributed load, Uniformly varying load. 2.3 Location of point of contra flexure. (Problem to be based on simply supported and cantilever beams with point load and UDL only)	06	
03	Principal stresses and planes. 3.1 Determine normal stress, shear stress and resultant stress on oblique plane 3.2 Define principal plane & principal stress 3.3 Determine principle plane, principal stresses analytically 3.4 Determine principal stress from Mohr's circle (only simple numerical). Thin Cylindrical shell -- 4 Marks • Stresses in thin closed cylindrical vessels subjected to internal pressure, Hoop stress, Radial & Axial Stress.(Simple numerical sonly)	06	

04	**Moment of Inertia** 4.1 Concept & definition of Moment of inertia, radius of gyration. Parallel & perpendicular axes theorem.(No derivation) 4.2 Moment of inertia of square, rectangular, circular, semicircular, Triangular, Hollow square, Rectangular & circular only. 4.3 MI of angle section, Channel section, Tee- section, I Section about centroidal axis& any other axis parallel to centroidal axis. 4.4 Polar moment of inertia.	06	
05	**Bending and Shear stresses** 5.1 Theory of simple bending, Assumptions in the theory of bending, moment of resistance, section modulus & neutral axis. Stress distribution diagram for Cantilever & simply supported beam. 5.2 Equation of bending (No derivation) 5.3 Simple numeral problem. 5.4 Concept of direct & transverses hear stress. 5.5 Shear stress equation(No derivation) 5.6 Shear stress distribution diagrams Averages hear stress & Maximum shear stress for rectangular &circular section.	06	
06	**Combination of Direct and Bending Stresses** 6.1 Concept of Axial load, eccentric load, direct stresses, bending stresses, maximum & minimum stresses. 6.2 Stress distribution diagram. 6.3 Condition for no tension in the section. 6.4 Problems on the above concepts for machinepartssuchasoffsetlinks,C-clamp,Benchvice,Drillingmachineframeetc. **(Simple problems on the above applications)**	04	
07	**Torsion** 7.1 Concept of Pure Torsion, Assumptions in theory of pure Torsion, Torsion equation for solid and hollow circular shafts. 7.2 Power transmitted by a shaft. 7.3 Comparison between Solid and Hollow Shafts subjected to pure torsion (no problem on composite and non homogeneous shaft)	03	
08	**Deflection and Slope of Beam** **8.1** Concepts of Deflection & Slope of beams-relation between bending moment and slope. Deflection of simply supported beams and cantilever beams subjected to point load(No Derivation)	03	
	Total	**42**	

Reference Books:

SN	Author	Title	P
01	R K Rajput	StrengthofMaterial	
02	B.K.Sarkar	StrengthofMaterial	TataMcGrawhillNewDelhi
03	Dr.R.K.Bansal	ATextBookstrengthofMaterial	LaxmiPublicationNewDelhi
04	SRamamrutham	StrengthofMaterial	DhanpatRai&PublicationNew
05	R.S.Khurmi	StrengthofMaterial	S.ChandCompanyLtd.Delhi
06	AndrewPytel FedrinandL.Singer	StrengthofMaterial	Addison-WesleyAnimprintofAddisonWesleyLongman,Inc.Fo
07.	S.S. Ratan	Strength of material	TMH

Subject : Strength of Meterials Lab

Subject Code : MEC309

List of Practical's :-

01 Hook's Law verification by Searl's apparatus.

02 Study and demonstration of Universal Testing Machine & its attachments.

03 Tension Test on mild steel/Aluminum on UTM.

04 Compression test on castiro non UTM.

05 Direct Shear Test of mild steel on UTM.

06 Brinell Hardness Test on Mild Steel.

07 Rock well hardness Test on Hardened Steel.

08 Izod & Charpy- Impact tests of a standard specimen.

09 Torsion Test of Mild steel bar.

10 To find Moment of Inertia of a flywheel.