

GUJARAT TECHNOLOGICAL UNIVERSITY

Diploma in Mechatronics Engineering

Semester: 3

Subject Code

Subject Name STRENGTH OF MATERIALS

Sr. No.	Course content
1.	Direct Stress and Strain : 1.1 Types of stresses and strains with suitable examples implied to mechanical engineering. - Direct stress : Tensile, compressive and shear. - Linear Strain - Lateral strain - Shear strain 1.2 Relationship between stress and strain with various concepts associated with it 1.3 Hooke's law and Modulus of Elasticity. 1.4 Concept of 'Composite Section ' and typical applications of it in mechanical elements. 1.5 Effect of temperature on a material properties and strength. 1.6 Type of loading and strain energy concept. 1.7 Stresses in a thin wall cylinder.
2.	Shear Force (SF) and Bending Moment (BM) : 2.1 Terms associated with SF and BM. 2.2 SF and BM diagrams with typical loads for : - Cantilever beam, - Simply supported beam, - Overhung beam
3.	Stresses in Beams : 3.1 Moment of Inertia: Concept, parallel axis and perpendicular axis theorem, moment of inertia for the symmetrical sections like rectangular, circular, hollow rectangular, hollow circular, section, T-section, C-section, etc. 3.2 Bending equation 3.3 Stress distribution for various beam sections. 3.4 Examples of various machine elements of beam sections with type of loading on them
4.	Deflections of Beams : 4.1 Concept and effect of slope and deflection. 4.2 Slope and deflection for - Simply supported Beam - Cantilever Beam

5.	Combined Direct and Bending Stresses : 5.1 Effect of combined direct and bending stresses. 5.2 Maximum and minimum stress diagram. 5.3 Limit of eccentricity and core of the sections.
6.	Columns and Struts : 6.1 Classifications, end conditions and various terms associated with Columns and Struts. 6.2 Euler's formula to determine critical loads.
7.	Torsion and Springs : 7.1 Theory associated with torsion. 7.2 Various terms associated with torsion. 7.3 Effect of torsion. 7.4 Relationship of Horse Power, Torque and RPM. 7.5 Stiffness of spring. 7.6 Types and applications of spring 7.7 Effect of typical loads on Helical and Leaf spring.
8.	Principal planes and principal stresses : 8.1 Concept of compound stress. 8.2 Mohr's circle. 8.3 Concept of Resultant stress and Calculation. 8.4 Principal planes and principal stresses.
9.	Riveted and Welded Connections : 9.1 Type of Connections. 9.2 Differentiate between Riveted and Welded connection. 9.3 Concept of Joint for Riveted Connection. 9.4 Efficiency of Joint. 9.5 Type of welded connection. 9.6 Welded connection for typical standard sections.
10.	Study of Materials : 10.1 List of the materials used as machine elements with BIS,ASME,JIS,EN standard designations. 10.2 Tabulation of typical strengths of different materials. 10.3 Study of standard tests as per B.I.S. 10.4 Comparison of the materials with their utility point of view.

(A) LABORATORY EXPERIENCES :

Experience Number	DESCRIPTION OF LABORATORY EXPERIENCE	HOURS ALLOTTED
1	Given various items of metals, identify materials of them. Also state the criteria to identify the material. State properties of each material. Also identify main alloying elements and reasons to add them.	02
2	Demonstration and study of Microscope.	02
3	Prepare ferrous micro specimens and examine them. Also prepare report on this.	04
4	Prepare non-ferrous micro specimen and examine it. Also prepare report on this.	02
5	Demonstration and study of Heat treatment furnaces.	02
6	Perform hardening process on various steel components. Measure the hardness of hardened components.	04
7	Perform hardening process specific material. Vary the quenching media and temperature. Prepare a comparative report on hardness of component varying quenching media and temperature.	04
8	Seminar preparation and representations by students .Each student is expected to deliver the talk for 10 minutes. Topic should be covered from the chapters not being covered in practicals.	04
9	Demonstration / Industrial visit on non destructive testing/heat treatment processes/surface coating/powder metallurgy. Also prepare industrial visit report.	04

(B) LIST OF DEMONSTRATIONS AND TUTORIAL SOLVING

Sr.no.	Title of demonstration and Tutorial solving	Rainforcement of Concept/Theory/Rule/Process
1.	Thin Cylindrical Shells	Hoop & Longitudinal stress Model
2	Deflection of beams	Slope & deflection Relation Model between simply supported cantilever beams
3.	Columns & Struts	Effective Length as regards Model to end conditions
4.	Torsion	Deflection of springs, no. of Model turns, etc.

NOTES :

1. Term work report content of each experience should also include following.
 - a. Experience description / data and objectives.
 - b. Skill/s which is / are expected to be developed in student after completion of experience.
 - c. Drawing of experience / setup with labels/nomenclature to carry out the experience
 - d. The specifications of machines / equipments / devices / tools / instruments /items/elements which is / are used to carry out and to check experience.
 - e. Process parameters / setup settings' values applied to carry out experience.
 - f. Steps / Process description to execute experience.
 - g. Observations
 - h. Information on recent machines / equipments / devices / tools / instruments /items available in market to carry out the experience.
 - i. Special / Additional notes or remarks.
2. Term work report of student of regular mode should exclude Distance Learning manual, photocopies , printed content, etc. Focus should be on developing the term work as original efforts of students.
3. Term work also includes experience logbook duly certified by subject teachers.

Reference Books :

1. Strength of materials R.S.Khurmi
2. Strength of materials S.Ramamrutham
3. Applied mechanics S.B Junnarkar
4. Mechanics of structure S.B Junnarkar
5. Strength of materials Vajirani & Ratwani
6. Strength of materials Dr. B.C. Punmia