

| GANPAT UNIVERSITY  |   |                        |                 |              |                            |                                     |                           |     |           |
|--|---|------------------------|-----------------|--------------|----------------------------|-------------------------------------|---------------------------|-----|-----------|
| FACULTY OF ENGINEERING & TECHNOLOGY  |   |                        |                 |              |                            |                                     |                           |     |           |
| Programme  |   | Bachelor of Technology |                 |              | Branch/Spec.               |                                     | Petrochemical Engineering |     |           |
| Semester   |   | III                    |                 |              | Version                    |                                     | 1.0.0.0                   |     |           |
| Effective from Academic Year   |   |                        |                 | 2020-21      |                            | Effective for the batch Admitted in |                           |     | July 2019 |
| Subject code   |   | 2PCE3103               |                 | Subject Name |                            | STRENGTH OF MATERIALS               |                           |     |           |
| Teaching scheme  |   |                        |                 |              | Examination scheme (Marks) |                                     |                           |     |           |
| (Per week)   | Lecture(DT)   |                        | Practical(Lab.) |              | Total                      |                                     | CE                        | SEE | Total     |
|  | L   | TU                     | P               | TW           |                            |                                     |                           |     |           |
| Credit   | 3   | 1                      | 0               | 0            | 4                          | Theory                              | 40                        | 60  | 100       |
| Hours  | 3   | 1                      | 0               | 0            | 4                          | Practical                           | 0                         | 0   | 0         |
| Pre-requisites:  |   |                        |                 |              |                            |                                     |                           |     |           |
| <ol style="list-style-type: none"> <li>1. Basic knowledge of mathematics</li> <li>2. Understanding of Engineering Mechanics</li> </ol>   |   |                        |                 |              |                            |                                     |                           |     |           |
| Course Objective   |   |                        |                 |              |                            |                                     |                           |     |           |
| <ul style="list-style-type: none"> <li>• To Calculate and draw bending moments and shear forces diagrams in beam.</li> <li>• To know about simple stresses and strains.</li> <li>• Student will understand concept of shear forces and bending moments.</li> <li>• To know about Stress distribution of the section of an eccentrically loaded rectangular column</li> </ul> |   |                        |                 |              |                            |                                     |                           |     |           |
| Theory syllabus  |   |                        |                 |              |                            |                                     |                           |     |           |
| Unit   | Content   |                        |                 |              |                            |                                     |                           |     | Hrs       |
| 1  | <b>Simple Stresses and Strains:</b> Introduction; Definition of stress and strain; tensile and compressive stresses; shear stress, Elastic limit, Hooke's law, Poisson's ratio, modulus of Elasticity, modulus of Rigidity, Bulk Modulus; stresses in composite sections; Volumetric strain; Temperature stresses. Strain Energy Stresses due to different types of axial loading; Gradually applied loads, Suddenly applied loads, Impact loads  |                        |                 |              |                            |                                     |                           |     | 9         |
| 2  | <b>Shear Forces and Bending moments:</b> Concept of Shear force and Bending moment; Sign conventions; Shear force and Bending moment diagrams for cantilevers, simply supported beams and beams with overhang; point of contra flexure; member subjected to couples. <b>Stresses in Beams</b> Definition; Pure or simple bending, theory of simple bending; Neutral layer, Neutral axis, Moment of resistance, assumptions in the theory of simple bending; Section modulus for rectangular, circular, I section and T section. Flitched Beams Definition; Equivalent section, modular ratio, moment of resistance in flitched beams. Shear stress distribution in Beams sections Shear stress distribution on rectangular, circular, I section and T section.. |                        |                 |              |                            |                                     |                           |     | 11        |
| 3  | <b>Deflection of Beams</b> :Member bending into a circular arc; Slope, deflection and radius of curvature; Cantilevers and simply supported beams. Macaulay's method for slope and deflection in cantilevers, simply supported beams and beams with overhang.   |                        |                 |              |                            |                                     |                           |     | 6         |
| 4  | <b>Direct and Bending Stresses</b> :Stress distribution of the section of an eccentrically loaded rectangular column; Core of Kern of the section, Circular and hollow sections. <b>Columns and Struts</b> Introduction; axially loaded compression members; crushing load; Buckling or critical load, Euler's theory of long columns, assumptions made in Euler's theory; Empirical formulae; Rankine's formula..  |                        |                 |              |                            |                                     |                           |     | 8         |

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| 5  | <b>Torsion of Shafts And Pure Torsion:</b> Theory of pure torsion; Torsional moment of resistance; assumptions in the theory of pure torsion; Polar modulus; Power transmitted by circular and hollow shafts; Torsional rigidity. Close coiled helical springs Stiffness, deflection, shear stress and Strain energy | 6 |
| 6  | <b>Thin Cylinders and Sphere:</b> Thin cylinders; Circumferential and Longitudinal stresses; Thin spherical shells. Riveted Connections Types of joints; Lap and Butt joints; Failure of riveted joints; Tearing strength, shearing strength and bearing strength; Efficiency of a joint.                            | 5 |
| Practical content  |  |   |
| Text Books   |  |   |
| 1  | Strength of Materials by S. Ramamrutham.   |   |
| 2  | R. S. Khurmi, "Strength of materials", S. Chand & Co. New Delhi, 13 <sup>th</sup> Revised Edition  |   |
| Reference Books  |  |   |
| 1  | Strength of Materials by B. C. Punmia  |   |
| 2  | M. Chakraborti, S. K. "Strength of materials", Kataria & Sons, 2013.   |   |
| 3  | TimoShenko, "Strength of materials", CBS Publisher New Delhi, 5th Edition.   |   |
| ICT/MOOCs references   |  |   |
| 1  | <a href="https://nptel.ac.in/courses/112107146/">https://nptel.ac.in/courses/112107146/</a>  |   |
| 2  | <a href="https://www.youtube.com/watch?v=GkFgysZC4Vc">https://www.youtube.com/watch?v=GkFgysZC4Vc</a>  |   |
| 3  | <a href="https://www.mooc-list.com/course/mechanics-materials-i-fundamentals-stress-strain-and-axial-loading-coursera">https://www.mooc-list.com/course/mechanics-materials-i-fundamentals-stress-strain-and-axial-loading-coursera</a>  |   |
| 4  | <a href="https://onlinecourses.nptel.ac.in/noc17_ce22/preview">https://onlinecourses.nptel.ac.in/noc17_ce22/preview</a>  |   |
| Course Outcomes  |  |   |
| <p>Calculate and draw bending moments and shear forces diagrams in beam.<br/>         To know about simple stresses and strains.<br/>         Student will understand concept of shear forces and bending moments.<br/>         To know about Stress distribution of the section of an eccentrically loaded rectangular column</p> |  |   |