

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme		Bachelor of Technology			Branch/Spec.		Mechatronics Engineering		
Semester		III			Version		1.0.0.0		
Effective from Academic Year			2019-20		Effective for the batch Admitted in			July 2018	
Subject code		2CI3111		Subject Name		<b>STRENGTH OF MATERIALS</b>			
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50
Pre-requisites:									
<ol style="list-style-type: none"> <li>1. Basic knowledge of mathematics</li> <li>2. Understanding of Engineering Mechanics</li> </ol>									
Learning Outcome:									
<b>After learning this course, student should be able to:</b>									
<ul style="list-style-type: none"> <li>• Calculate and draw bending moments and shear forces diagrams in beam.</li> <li>• Differentiate bending stress, shear stress and principle stress.</li> <li>• Understand the design consideration of column and strut.</li> <li>• Determine the deflection and slop for various beam.</li> <li>• Design the shaft, key and coupling based on torsion theory.</li> </ul>									
Theory syllabus									
Unit	Content								Hrs
1	<b>Stresses &amp; Strains:-</b> Elastic, homogeneous, isotropic materials, limit of elasticity and proportionality, yield limit, ultimate strength, strain hardening, section of composite materials, prismatic and non-prismatic sections. Strains: Linear, shear, lateral, thermal and volumetric, Poisson's ratio. Stresses: Normal stresses axial- tensile and compressive, shear and complementary shear, thermal and hoop. Applications to composite material stepped and tapered bars.								7
2	<b>Bending Moment and Shear Forces in Beams:-</b> Bending moment and shear forces, Bending moment and shear force diagrams for statically determinate beams subjected to couples, connected forces, uniformly distributed loading, relation between bending moment, shear force and rate of loading, point of contra flexure.								6
3	<b>Bending Stresses in Beams:</b> Introduction, simple bending, theory of simple bending, moment of resistance, modulus of section, beam of uniform section, composite section.								5
4	<b>Shearing Stresses in Beams:</b> Introduction, shear stress distribution for beam of rectangular, circular, triangle and I- section.								3
5	<b>Principal Stresses and Strains:</b> Principal planes, principle stresses, Analytical method for principal stress, Mohr's circle of stress and strain, Theories of failure.								5
6	<b>Deflection of Beams:</b> Strain curvature and moment, curvature relations, differential equations for deflection of elastics beams, different methods for determining slope and deflections								5
7	<b>Columns and Struts:</b> Short column subjected axial forces and bending moments, engineering problems, long columns, stability and equilibrium, ranking formula, Indian standard formula, criteria for design of columns.								3
8	<b>Structured Connections:</b> Riveted and welded connections, methods of failure of connections, eccentric riveted and welded connections, design requirements.								3
9	<b>Torsion:</b> Basic assumption, Torsion formula, Design of circular sections, Angle of twist, Shearing stress, Deformation, Closed coiled helical springs, Helical Springs, power transmitted by shaft, keys & coupling								4

10	<b>Direct and Bending Stresses:</b> Members subjected to eccentric loads, middle third rule, and kernel of section, chimney subjected to wind pressure, retaining walls and dams subjected to hydraulic pressure.	4
Practical content		
The Practical/term work shall be based on the topics mentioned above and will be defended by the candidates.		
Text Books		
1	S. Ramamrutham, "Strength of materials", Dhanpatrai & Sons, 14 <sup>th</sup> Edition	
2	R. S. Khurmi, "Strength of materials", S. Chand & Co. New Delhi, 13 <sup>th</sup> Revised Edition	
Reference Books		
1	S. B. Junnarkar and H.J. Shah, "Mechanics of structure vol I", Charotar publishing house, Anand, 13th Edition.	
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>	