NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B.Tech. in Mechanical Engineering
Course Code:	2ME601
Course Title:	Solid Mechanics and Geometric Modelling
Course Type:	Core
Year of introduction:	2023-24

Credit Scheme

L	T	Practical component				C
		LPW	PW	W	S	
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Course Learning Outcomes (CLOs):

After successful completion of the course, student will be able to –

1	analyse the forces acting on the structural elements,	(BL4)
2	evaluate the stresses developed in structural elements,	(BL5)
3	relate properties of materials, principal stresses and theories of failure,	(BL2)
4	build part and assembly of mechanical components using solid modelling software.	(BL3)

Syllabus: **Total Teaching Hours: 30**

Unit	Syllabus	Teaching Hours
UNIT – I	**Statics and Distributed Forces** Principles of statics, Particle, Rigid body, Coplanar, Concurrent and non-concurrent parallel and non-parallel forces, Composition and resolution of force, Couples and their properties, Combination of coplanar couple and forces, Centre of gravity, Moment of inertia, Analysis of frictional forces.	08
UNIT-II	**Strength and Elasticity** Stresses: Axial, normal, in-plane, tensile, compressive, shear, flexural, thermal and hoop, complementary shear. Strain: Linear, shear, lateral, thermal and volumetric, Poisson's ratio, Elastic constants and relation between them and bodies subjected to loads in three directions. Mechanical Properties of Materials	06
UNIT-III	**Stresses in Beams and Shafts** Types of supports, Support reactions, Bending moment and shear force diagrams in statically determinate beams subjected to different types of	10

loading, Relation between bending moment, Shear force and rate of loading, Theory of simple bending, Bending stresses and their distribution, Moment of resistance, Modulus of section, Composite beam sections, Distribution of shear stress in different sections, Torsion of solid and hollow circular shafts, Shear stress due to torsion, Angle of twist, Torsional moment of resistance.

UNIT-IV   Principal Stresses and Theories of Failure   06

Compound stresses, Analysis of principal planes and principal stresses, Mohr circle, Maximum principal stress theory, Maximum shear stress theory, and Distortion energy theory.

Self – Study:	The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.
Laboratory Work:	Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated

Suggested Readings/References:	1. Meriam J.L., Kraige L.G., Engineering Mechanics: Static, Wiley-India 2. Hibbeler R.C., Mechanics of Materials. Pearson 3. Beer F. P., Johnston E. R., & Dewolf J.T., Mechanics of Materials, Tata McGraw-Hill Education 4. Rattan S. S., Theory of machines, Tata McGraw Hill Education. 5. Timoshenko S. P. & Young D.H., Elements of Strength of Materials, East-West Press Private Limited.

Suggested list of experiments: (not restricted to the following)

Sr. No	Title	Hours
1.	Study of sketch module of solid modelling software	2
2.	Creating solid model of components using extrude command	2
3.	Creating solid model of components using revolve command	2
4.	Use of hole, helical profile, Rib, etc. for constructions of geometry.	2
5.	Use of pattern, mirror, trim, etc. for constructions of geometry.	2
6.	Use of dimensions, planes, axes, etc. for constructions of geometry.	2
7.	Creating solid model of components using sweep and blend command	2
8.	Creating solid model of components using loft and swept blend command	2
9.	Creating an assembly from the solid models of components.	2
10.	Creating sections views and exploded views.	2
11.	Introduction to the Machine Drawing.	2
12.	Creating assembly drawing and Bill of Material (BOM).	2
13.	Creating detail drawing of components as per drawing standards.	2