Strength of materials

The objective of studying of materials will be how to determine stress, strain and deformation produced by different loads (e.g. normal , shear , torsion , bending and combined loads). Understanding how to use the state of stress to evaluate the principal stresses . Understanding theories of failure and how to use them in design .

Intended Outcomes

Upon completion of the course student should be able to :

- Analyze and design solid bodies (e.g. axially – loaded bars , shafts , beams and columns) subjected to tension , compression , torsion , bending and combined stresses using the fundamental concepts of stress , strain and elastic behavior of materials .
- Calculate and represent shear force and bending moment diagrams .
- Solve problems relating to pure and non – uniform bending of beams .
- Solve problems relating to torsional deformation of bars and beams .
- Calculate the slope and deflection in beams .
- Understand the concept of buckling and be able to solve the problems related to different types of columns .

Outcomes Learning Objective	ABET Criteria 3										
	a	b	c	d	e	f	g	h	i	j	k
Compute stress , strain and deformation in axial member	√	√			√						
Compute direct shear stresses	√	√			√						
Compute torsional shear stresses	√	√			√						
Compute stresses in pressure vessels	√	√			√						
Compute bending stresses	√	√			√						
Compute the deflection of beams and shafts	√	√			√						
Compute the state of stress at a point in a member	√	√			√						
Determine the principal stresses at a point	√	√			√						
Determine the principal strain at a point	√	√			√						
Utilize theories of failures	√	√			√						
Compute column critical load and stress	√	√			√						
Prepare well documented problem solution							√				

Criterion 3a: an ability to apply knowledge of mathematics , science , and engineering

Criterion 3b: an ability to design and conduct experiments , as well as to analyze and interpret data .

Criterion 3c: an ability to design a system , component , or process to meet desired needs.

Criterion 3d: an ability to function on multidisciplinary teams.

Criterion 3e: an ability to identify , formula , and solve engineering problems .

Criterion 3f: an understanding of professional and ethical responsibility .

Criterion 3g: an ability to communicate effectively .

Criterion 3h: the broad education necessary to understand the impact of engineering solution in a global and social context .

Criterion 3i: a recognition of the need for , and an ability to engage in life – long learning .

Criterion 3j: a knowledge of contemporary issues .

Criterion 3k: an ability to use the techniques , skills , and modern engineering tool necessary for engineering practice .