Mechatronics Engineering Lectures

Subject: Mechanics of Materials MET204 **Class**: 2nd

Lecture Contents:	**Name:**	**Principles of statics**	**Lecture Number:**	**1**

Topics:

1. **Equations of equilibrium**
2. **Internal resultant loads**

Contents:

1. A review for some of the important principles of statics and to show how they are used to determine the internal resultant loadings in a body.
2. Equilibrium of deformable body
3. Support Reactions
4. coplanar loadings

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Mechatronics Engineering Lectures

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Lecture Contents:	**Name:**	**Stress**	**Lecture Number:**	**2**
	Topics: 1. **Stress: Normal stress (tensile stress, compressive stress)**			
	Contents: 1. **General state of stress** 2. **Average normal stress in an axially loaded bar** 3. **Maximum average normal stress** 4. **Normal force diagram**			

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Lecture Contents:	**Name:**	**Stress**	**Lecture Number:**	**3**
	Topics: 1. **Shear stress**			
	Contents: 1. **Average shear stress** 2. **Shear stress equilibrium** 3. **Maximum average shear stress** 4. **Allowable stress** 5. **Design of a simple connections**			

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Mechatronics Engineering Lectures

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Lecture Contents:	**Name:**	**Strain**	**Lecture Number:**	**4**

Topics:

1. **Deformation**
2. **Normal strain**
3. **Shear strain**
4. **General state of strain.**

Contents:

For the properties of materials, whenever subjected to stress there is deformation accompanied by this stress. This deformation in the body can be represented by the concept of normal and shear strain. In this subject we will be able to define these quantities and show how it can be determined.

Deformation: Whenever a force is applied to a body, it will tend to change the body's shape and size. These changes are referred to as **deformation**. Deformation of a body can also occur when the temperature of the body is changed.

Shear strain: Is the change in angle between the originally perpendicular two lines after deformation

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Subject: Mechanics of Materials MET204 **Class:** 2nd

Lecture Contents:	**Name:**	Mechanical Properties of Materials	**Lecture Number:**	**5**

Topics:

1- **Mechanical properties of materials**
2- **Ductile materials, brittle materials**
3- **Hooke's law**
4- **Modulus of resilience**
5- **Modulus of toughness**
6- **Poisson's ratio**
7- **Shear stress-strain diagram**
8- **Shear modulus of rigidity**
9- **Failure of Creep and Fatigue.**

Contents:

In this subject, the stress-strain relationship depending on experimental method will be presented. The behavior of some materials will be discussed on stress-strain diagram. Mechanical properties and tests related to mechanics of materials will be discussed.

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Lecture Contents:	**Name:**	Mechanical Properties of Materials	**Lecture Number:**	**6**

Topics:

1- **Mechanical properties of materials**
2- **The tension and compression test**
3- **Conventional stress-strain diagram**
4- **True stress-strain diagram.**
5- **Ductile materials, brittle materials**
6- **Hooke's law**
7- **Modulus of resilience**
8- **Modulus of toughness**
9- **Poisson's ratio**
10- **Shear stress-strain diagram**
11- **Shear modulus of rigidity**
12- **Failure of Creep and Fatigue.**

Contents:

In this subject, the stress-strain relationship depending on experimental method will be presented. The behavior of some materials will be discussed on stress-strain diagram. Mechanical properties and tests related to mechanics of materials will be discussed.

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Subject: Mechanics of Materials MET204 **Class:** 2nd

Lecture Contents:	**Name:**	**Axial load**	**Lecture Number:**	**7**

Topics:

1. **Axial load**
2. **Elastic deformation of an axially loaded member**
3. **Superposition**
4. **statically indeterminate axially loaded member**
5. **Thermal stress**

Contents:

In this chapter we will discuss how to determine the deformation of these members, and we will also develop a method for finding the support reactions when these reactions cannot be determined strictly from the equations of equilibrium. An analysis of the effects of thermal stress, stress concentrations, inelastic deformations, and residual stress will also be discussed.

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Mechatronics Engineering Lectures

Subject: Mechanics of Materials MET204 **Class:** 2nd

Lecture Contents:	**Name:**	**Torsion**	**Lecture Number:**	**8**

Topics:

1- Torsion: torsional deformation of a circular shaft

2- Torsion formula

Contents:

In this chapter we will discuss torsional deformation of a circular shaft or tube when the material behaves in a linear elastic manner torsion formula, angle of twist (how to determine the stress distribution within the member.

When an external torque is applied to a shaft it creates a corresponding internal torque within the shaft. The torsion formula is to relate the external torque to the shear stress distributed on the cross section of a circular shaft or tube

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Subject: Mechanics of Materials MET204 **Class:** 2nd

Lecture Contents:	**Name:**	**Bending**	**Lecture Number:**	**9**
	Topics: **1- Bending on beams and shafts** **2- Establishing Shear and moment diagrams**			
	Contents: In this chapter, bending in shafts and beams will be studied for its importance in structures and mechanical elements in engineering. Stresses caused due to bending will be determined. Previously, we learned how to determine the axial force and torque diagrams. In this section, we will learn how to establish a **shear and moment diagrams** for beams and shafts			

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Subject: Mechanics of Materials MET204 **Class:** 2nd

Lecture Contents:	**Name:**	**Torsion**	**Lecture Number:**	**10**
	Topics: **1- Torsion formula (Twist Angle)** **2- Power transmission.**			
	Contents: In this chapter we will discuss torsion formula, angle of twist (how to determine angle of twist caused by torsional loadings), power transmission, and statically indeterminate torque-loaded members.			

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Subject: Mechanics of Materials MET204 **Class:** 2nd

Lecture Contents:	**Name:**	**Bending**	**Lecture Number:**	**11**
	Topics: **1- Bending Deformation of a Straight Member** **2- The Flexure Formula**			
	Contents: In this section, we will develop an equation that relates the stress distribution in a beam to the internal resultant bending moment acting on the beam's cross section.			

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