Engineering Program

Specialization Production and Computer Aided Manufacturing Technology
Course Number ٠٢٠٢٠٢٢٩٠
Course Title **Engineering Materials Testing**
Credit Hours (3)
Theoretical Hours (3)
Practical Hours (0)

Brief Course Description:

Principles of statics including equilibrium and static equivalence. Determination of moment and force resultants in slender members. Introduction to mechanics of deformable bodies: concepts of stress and strain, classification of materials behavior, stress-strain relations and generalized Hooke's law. Applications to engineering problems involving members under axial load, torsion of circular rods and tubes, bending and shear stresses in beams, combined stresses in beams, combined stresses, deflection of beams, buckling of columns. Methods of materials testing. Equipment and procedures of testing. Standards and references.

Course Objectives:

At the end of this course student will be able to:
1. To explain the concepts of, and the relations between stress and strain
2. To study the moments, forces, and loads applied on materials
3. To study the methods, equipments, and procedures of materials' testing
4. To understand standards and references related to materials' testing

Detailed Course Description:

Number	Title	Content	Time
	Engineering materials and their properties	Engineering materials properties Mechanical properties of materials Engineering materials testing Engineering materials specifications Codes and standards Standardization organizations Units Types of loads Linear stress and shear stress Thin walled vessels Engineering stress Engineering strain True stress True strain Deformation and strain Young's modulus, E Poisson's ratio Hook's law Permanent deformation Measurement Toughness Resilience Strain energy Relation between deformation and stresses in surface deformations and bulk deformations Compound stresses Own weight deformation Thermal Stresses	
	Bending Moment	Bending moment stress and strain Types of supports	

		Types of bending loads Calculation of reactions and bending moments at supports Bending moment -shear loads/stresses determination rules Deflection and buckling loads in long columns (Euler rule); Critical load determination	
	Tensile test	Tensile test machine Standard tensile test specimens Load and stress Elongation and strain Engineering stress Engineering strain True stress True strain Deformation and strain Young's modulus, E Poisson's ratio Hook's law Tensile test load-elongation diagram Tensile test stress-strain diagram Mechanical properties of materials in tensile test Mechanical properties of materials in elastic range Mechanical properties of materials in plastic range Permanent deformation Measurement Toughness Resilience Strain energy Types of fracture in tensile test Factors affecting tensile strength of materials Tensile test variables Tensile test specimen variables	
	Compression test	Demands for compression test Behavior of materials under compression load Compression test stress-strain diagram Standard compression test specimens Compression test specimens limitations Factors affecting compression strength of materials	
	Torsion test	Torsion test machine Torsion test specimens Mechanical properties of materials in torsion test Types of fracture in torsion test	
	Impact test	Impact test machine Types of impact tests: Charpy, Izod	

		Calculations of energy conservation relations Factors affecting impact test Types of fracture in Impact test	
	Hardness test	Hardness test machine Hardness test limitations Hardness test types: Vicker's, Brinnel, Rockwell, Knope, … Demand for hardness test Indenter shapes and materials Loads Testing criteria Specimens specifications Relations between different hardness numbers and conversion between them	
	Non-destructive tests (NDT) - nondestructive examination (NDE), nondestructive inspection (NDI), nondestructive evaluation(NDE)	Importance Demand Types of defects can be detected Eddy-current (ET) Magnetic-particle (MT) Liquid penetrant (PT) (fluorescent or non-fluorescent) Radiographic (RT) Ultrasonic (UT) Visual testing and optical observation (VT) Specimen preparation Precautions	

Evaluation Strategies:

Evaluation		**Percentage**	**Date**
Exams	Midterm	٤٠%	
	Final Exam	50%	
Projects and assignments		١٠%	

Teaching Methodology:

- Lecturing
- Technical videos watching

Text Books & References:

Text Books:

- اختبار المواد، الإدارة العامة لتصميم وتطوير المناهج، المؤسسة العامة للتعليم الفني والتدريب المهني، المملكة العربية السعودية
- مقاومة المواد، إياد الداهوك، شادس أبو سريس
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References:

- Engineering Mechanics/Statics by J.L.Meriam, last edition
- Mechanics of Materials by Russell C.Hibbeler, last edition
- Statics and Mechanics of Materials by William F.Riley, Gohn Wiley & Sons, last edition
- Mechanics of Materials, by Ferdinand Beer, last edition