Mechatronics Engineering Lectures

Subject: Fluid Mechanics

Class: 2nd

Lecture Contents:	**Name: Dr. Laith M.J.**		**Lecture Number:**	**(1)**
	Topics: **1**-Introduction 2-Approaches to study fluid mechanics			
	Contents: **1**-What is fluid mechanics?, Matter classification: solid and fluid, fluid classification; liquid and gas, normal stress, shear stress, pressure, Fluid mechanics: static and dynamic, Newton's second law **2-** Analytical method, Experiments and Computation (Computation Fluid Dynamic, CFD).			

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Lecture Contents:	**Name: Dr. Laith M.J.**		**Lecture Number:**	**(2)**
	Topics: **1**-Fluid applications 2-Dimensions and Units			
	Contents: **1-** Applications: Hydrodynamics, Hydraulics, Gas dynamics, Aerodynamics, Meteorology, oceanography, and hydrology **2-** Definition of Dimensions and Units, SI and BG units, Primary and Secondary dimensions, and examples for find the dimensions, Dimensional Homogeneity, Dimensionless groups. examples			

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Lecture Contents:	**Name: Dr. Laith M.J.**		**Lecture Number:**	**(3)**
	Topics: **1**-Properties of Fluid 2-Ideal (or perfect) Gas Law			
	Contents: **1-** Definition fluid properties and their units and dimensions, Density, Specific Volume, Specific Weight, Specific Gravity, examples and exercises.. . **2-** Ideal Gas Law application, examples and exercises.			

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	Name: Dr. Laith M.J.		**Lecture Number:**	**(4)**
	Topics: **1-** Viscosity 2-Fluid Shear Stress			
Lecture Contents:	**Contents:** **1-** Viscosity; Dynamic and Kinematic Viscosity, Temperature Dependency, **2-** Derivation of fluid shear stress equation, Newtonian and Non-Newtonian Fluids.			

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	Name: Dr. Laith M.J.		**Lecture Number:**	**(5)**
	Topics: **1-** Application of shear stress equation 2- Compressibility			
Lecture Contents:	**Contents:** 1- linear and non-linear velocity profile, shear stress between two plate, shear stress for rotational cylinder or disc, examples and exercises.. **2-** Bulk modulus of elasticity definition, Compression and Expansion of Gases, Process; Isothermal and Isentropic			

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	Name: Dr. Laith M.J.		**Lecture Number:**	**(6)**
	Topics: **1-** Speed of Sound, Mach number 2- Surface Tension			
Lecture Contents:	**Contents:** 1- Derivation the equation of speed sound in gas and liquid, flow classification according the values of Mach number, subsonic, transonic and supersonic, examples **2-** Surface Tension definition, Surface Tension for soap bubble, bubble and spherical droplet, examples.			

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	Name: Dr. Laith M.J.		**Lecture Number:**	**(7)**
	Topics: **1-** Capillary rise 2-Introduction of Fluid Static (Hydrostatics)			
Lecture Contents:	**Contents:** 1- Derivation capillary rise equation, capillary rise in water and mercury, wetting and non-wetting liquid, examples and exercises. **2-** Definition of Fluid Static (Hydrostatics) and applications, Newton's second law, pressure definition.			

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Lecture Contents:	**Name: Dr. Laith M.J.**		**Lecture Number:**	**(8)**
	Topics: **1-** Pressure at a Point and Pressure (surface) Force on a Fluid Element 2- Pressure variation in a Fluid at Rest			
	Contents: **1-** Derivation of pressure at point, Pascal's Law, surface pressure, body force, and viscus force, 2- Derivation of Hydrostatic pressure distribution for compressible incompressible fluid, examples and exercises.			

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Lecture Contents:	**Name: Dr. Laith M.J.**		**Lecture Number:**	**(9)**
	Topics: **1-** Standard Atmosphere and variation of temperature with altitude, 2- Absolute Pressure, Gage Pressure and Vacuum Pressure			
	Contents: 1- Derivation of pressure and density distribution equations with altitude , H=0 to 11 Km and H=11 to 20 Km, examples and exercises. 2- Definition of Absolute Pressure, Gage Pressure and Vacuum Pressure, examples.			

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Lecture Contents:	**Name: Dr. Laith M.J.**		**Lecture Number:**	**(10)**
	Topics: **1-** Pressure Measurements 2- Mechanical gage and electrical pressure device			
	Contents: 1- Barometer : Mercury and Aneroid Barometer, Piezometer Tube, U-Tube Manometer, Differential U-tube manometer, Inclined-tube manometer 2- Bourdon gage, Pressure transducers, examples and exercises.			