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|  logo Engineering Faculty Civil Engineering Department Course Title: **Strength of Materials** Course No: **-**0901205Credit Hours: 3 C.H.Semester : First - 2020/2021**About The Course** Course Title:  **Strength of Materials**   Class : A Course No:0901205 Credit Hours: 3 C.H. Lecture Room: 409 Pre-requisite Course : Statics No. 0901203 Obligatory/ Optional : Obligatory Text Book: *Mechanics of Materials – by* ***Hibbeler R.C****., Prentice Hall Inc. 2003,*  Reference: *Mechanics of Materials by Beer &Johnston ,* ***Mc.Graw****-Hill ,5th edition 2009.***The Instructor** Name : Dr. Shehdeh Mohammad Ghannam Title : C. E. Department Member Office No : 309 Office Hours: 12:30-2:00 Sunday &Tuesday  E. mail : sh.ghanam @ jpu.edu.jo ; E. mail : shehdeh\_ghannam @yahoo.com |

 **Course Description**

*Introduction to the subject of mechanics of materials ( strength of materials), classification of structures, loads types, supports, Hooks law , deformation, stress and strain under axial and uniaxial load, thermal stresses , torsion, stress and strain under pure bending , composite stresses , shear forces and shear stress, ,beam deflection by different methods, buckling of columns , internal loading in structures, , analysis of internal forces in beams, shear and bending moment diagrams for beams .*

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| **Course Objectives** |

 *Develop the skills to analyze the behavior and response of structures to various loads and constraints. To introduce civil engineering students to mechanics of materials ( strength of materials), and make the student in civil engineering specialization to be able to determine internal forces in beams . To enhance the students with knowledge of drawing shear force and bending moment diagrams and normal force diagrams . Establish foundation knowledge and skills to different method of deflection calculations, and composite stress calculations for composite sections.*

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| **Learning Outcome** |

Making students aware of how language works to convey meaning as its basic function

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| **Course Outline and Time schedule** |

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| **Course Outline** | **Week** |
| سحب واضافة--- دوام الهيئة التدرييسية | Withdraw & Adding ( 11/10/2020- 14/10) |
| **Introduction** to mech. of materials CH.1 | 1st Week( 18/10/2020- 21/10) |
|   **The relationship between** : Factor of safety **-FOS** -, Modulus of Elasticity- **E**, Rigidity- **G** & Poisson’s ratio – ***ᵥ***  CH.2  | 2ed week( 25/10- 28/10) |
| **Simple Stresses & Strains , Normal stresses** : Elasticity and plasticity – Types of stresses & strains – Hooke‟s law – stress & strain diagram for mild steel CH.3  | 3ed week( 1/11- 4/11) |
| **Shear Stresses: Due to Shear Force and Torsion and Torque:** Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular sections .CH4**Thermal Stresses** CH5 | 4th week( 8/11- 11/11) |
| **Exam 1** **– CH.1 - CH.5** | 5th week( 22/11- 25/11) |
| **Shear Force and Bending Moment** : Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported, continues & overhanging beams subjected to point loads, U.D.L., uniformly varying loads and combination of these loads -Relation between S.F., B.M . [CH6] | 6th week( 29/11- 2/12) |
| **Flexural ( Bending ) Stresses**: Theory of simple bending – Assumptions – Derivation of bending equation CH7 | 7th week( 6/12- 9/12) |
| **Deflection Of Beams**: Slope, deflection and radius of curvature –Differential equation for the elastic line of a beam – Double integration methods –moment area method.CH8 | 8th week(13/12- 16/12 ) |
| **Mohr’s theorems** CH9 | 9th week( 20/12 - 23/12 ) |
| **Exam 2** – CH6- CH9 | 10th week( 27/12 –30 /12 ) |
| **Buckling Of Columns**CH10 | 11th week( 3/1/2021 - 6/1 ) |
|  **Final Exam** | 12th week(10/1 - 13/1 ) |

**Presentation methods and techniques**

Methods of teaching varied according to the type of text, student and situation. The following techniques are usually used:

1. Lecturing with active participations.

Involve the civil engineering students in asking some questions related to the target topic of the course.

1. Problem solving.

Encourage the students to solve the given assignments and submit them at the definite time,

1. Cooperative learning.

By enhancing the students studying in groups .

1. Discussion.

To discuss the results and the answers of the target problems.

1. Learning by activities. To encourage the students to some group activity.
2. Connecting students with different sources of information.

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| Sources of information and Instructional Aids |

* Computer soft wear … power point
* Using white board.

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| **Assessment Strategy and its tools** |

The assigned syllabus is assessed and evaluated

Through: feed back and the skills that are acquired by the students

The tools:

1. Formal (stage) evaluation

a) Class Participation 10%

b) 1st Exam 20%

c) 2nd Exam 20%

d) Group activity and Quizzes 10%

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|  **Tool & Evaluation** |

 Tests and quizzes are permanent tools & assessment, in addition to the activity file which contains

 curricular and the co-curricular activities, research, report papers and the active participation of the student

 in the lecture.

 The following table clarifies the organization of the assessment schedule:

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| **Grade** | **Date** |

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| **Activities and Instructional Assignment** |

**Test** |
| 20 | 15/11/2020 | First Exam  |
| 20 | 27/12/2020 | 2nd Exam |
| 20 | Students should be notified about their marks | Activities & ParticipationAnd Quizzes |
| 40 | 24/1 - 27/1/2021 | Final Exam |

1. Practical assignments to achieve the syllabus objectives.
2. Group Activity and demonstrations.

**Regulations to maintain the teaching-Learning Process in the Lecture:**

1- Regular attendance.

2- Respect of commencement and ending of the lecture time.

3- Positive relationship between student and teacher.

4- Commitment to present assignments on time.

5- High commitment during the lecture to avoid any kind of disturbance and distortion.

1. Allowed Absence percentages is ( 15%).

**References :**

*Mechanics of Materials by Beer &Johnston ,* ***Mc.Graw****-Hill ,5th edition 2009.*

**Syllabus Classification**

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| **Objectives** | ***Learning outcome*** | ***Assessment tools*** |
| * ***Introduction*** *:**to the subject of strength of materials, load types.*
 |  *To produce student in civil engineering to be familiar with different types of loads.* | *By using solved problems.**Power point and weight board.*  |
| * ***Factor of safety****, Poisson’s ratio & volumetric strain –The relationship between* ***E, G & K***
 | *To develop the students skills in order to differentiate between*  ***E, G & K.*** *and to be familiar of* ***thermal stresses.*** | *By using solved problems.* |
| * ***Simple Stresses & Strains****: Elasticity and plasticity – Types of stresses & strains –* ***Hooke‟s law*** *– stress & strain diagram for mild steel*
 | ***Hooke‟s law*** *– stress & strain diagram for mild steel.* | *By using solved problems.* |
| * ***Shear Stresses and strains*** *: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular sections.* ***Shear stresses*** *due to* ***shear force and due to torsion****.*
* ***Thermal Stresses*** *.*
 | * *To improve the ability of the student to determine the Shear stress distribution across various beams sections like rectangular, circular, triangular sections.*
* *To improve the ability of the student to determine the Derivation of torsion equations; T/J = τ / r =θ / L*
 | *Power point and weight board.*  |
| * ***Determination of the following features:***

 *Shear Force And Bending Moment:* *Free body diagrams, reactions.* *Definition of beam – Types of beams .** *S.F and B.M diagrams for cantilever, simply supported, continues & overhanging beams subjected to point loads, U.D.L., uniformly varying loads and combination of these loads -Relation between S.F., B.M . S.F. in Beams .*
 | *To make the student to have capability in determining :* * *Shear forces in Beams*
* *Bending in Beams,*
 | *Power point and weight board.*  |
| * ***Flexural (Bending)Stresses****: Theory of simple bending –*
* *Determination of bending stresses – section modulus of rectangular and circular sections (Solid and Hollow).*
 | *To teach the student how to understand the bending stresses – section modulus of rectangular and circular sections (Solid and Hollow).* | *By using solved problems.* |
| * ***Deflection*** *:*
* *Principals for beams –*
* *Double integration methods*
* *Virtual work method..*
* *Moment-Area Method.*
* *Conjugate Beam Method*
 | *Deflection in Determinate Structures.** *Double integration methods*
* *Virtual work method..*
* *Moment-Area Method.*
* *Conjugate Beam Method*
 | *Power point and weight board.* |
| * ***Mohr’s theorems***
* ***buckling of columns***
 | * *To improve the ability of the student to determine the Mohr’s theorems & buckling of columns.*
 | *Power point and weight board.* |

**Strength Of Material (SOM)**

**Contents**:

1. CH1 : **Introduction** to Mechanics of Materials.
2. CH2 : Factor of Safety ***FS***  ,**the relationship between** ***E***-modulus of elasticity ,  ***G***- modulus of rigidity

 & ***ᵥ*** - Poisson’s ratio .

1. CH.3 : **Types of loadings ,**
2. CH.4 : **Type of Stresses .**
	1. **Normal Stress : Compressive Stress and Tensile Stress**
	2. **Shear Stresses.**
* Due to Shear .Force
* Due to Torsion**.**
* Angle of twist
	1. **Bearing Stress**
	2. **Combined Stresses**

5. CH.5 : **Thermal stresses**.

6. CH.6 : **Shear Force and Bending Moment** .

1. CH.7 : **Flexural Stresses** . {**Bending Stresses** and **Strain**}
2. CH.8 : **Mohr’s theorems** - Transformation of axes- Principal stresses and maximum shear stress.
3. CH9 : **Deflection of Beams** .
4. CH10 : **Buckling of Columns.**