COURSE PLAN

FIRST: BASIC INFORMATION

College	
College	: Karak University College
Department	: Department of Basic and Informatics Sciences

Course	
Course Title	: Structure Mechanics
Course Code	: 020112235
Credit Hours	: 3 (3 Theoretical, 0 Practical)
Prerequisite	:020000161*
	*Co-requisite

Instructor	
Name	: Rayah Nasr Salam Al-Dala'ien
Office No.	: -
Tel (Ext)	: -
E-mail	: Rayah.Nasr1@bau.edu.jo
Office Hours	: -

Class Times					

Text Book

- Engineering Mechanics-Statics, Hibbeler, R.C.14th Edition, Pearson Prentice Hal.
- Mechanics of Materials, Hibbeler, R. C.8th Edition, Pearson Prentice Hall.

References

- الاستاتيكا – د. ياسر الحنيطي، د. محمد الرجوب، د. طارق رشيد، دار المسيرة للنشر والتوزيع، 2011.
- **الميكانيكا الهندسية – د.سليمان ابوعين، د.وليد المومني، مكتبة المجتمع العربي للنشر والتوزيع.**
- **مقاومة مواد – م.إياد الداهوك، مكتبة المجتمع العربي للنشر والتوزيع 2012 .**
- Vector Mechanics for Engineers-Statics, 10th Edition,, F.P.Beer, E.R.Johnston, D.F.Mazurek, McGraw-Hill, Inc., 2013, ISBN 978-1-259-00792-7.

SECOND: PROFESSIONAL INFORMATION

COURSE DESCRIPTION

This course covers working knowledge of statics and strength of materials to understand the mechanical relationships and stability of structure. And it provide basic concepts such as moments of force, stress and strain, and buckling.

COURSE OBJECTIVES

The objective of this course is to enable the student to do the following:

-Define force and moment vectors and give necessary vector algebra
-Explain the concept of equilibrium of particles and rigid bodies in plane and 3D space
-Define support types and to developed ability to calculate support reactions
-Explain the equilibrium of structures and internal forces in beams
-Explain distributed loads
-Explain centroid and moment of inertia
-Define stress and strain, Hook's law, stress-strain diagram, axial load, buckling, bending and torsion.
-Compute and draw the shear-force and bending moment diagram for transverse loading on a beam.
-Explain basic concepts and principles of strength of materials.
-Calculate stresses and deformations of objects under external loadings.
-Apply the knowledge of materials strength to engineering applications and design problems.

COURSE LEARNING OUTCOMES

On successful completion of this course, students are expected to be able to:

CLO1. Explain the fundamental concepts of vectors, equilibrium of particles and rigid bodies in plane and 3D space.
CLO2. Analyze the properties (components, resultants and moments) of a force and force systems in 2D & 3D.
CLO3. Solve equilibrium problems of various types of structures using analytical models, rigid bodies, FBDs and equations of equilibrium.
CLO4. Apply and demonstrate the principles and tools of STATICS in the analysis and solution of equilibrium problems based on a real-world scenario.
CLO5. Solve the properties (centroid, center of gravity and moment of inertia) of areas, lines and volumes and apply these properties in equilibrium problems.
CLO6. Solve problems relating to pure and non-uniform bending of beams and other simple structures.
CLO7. Explain the fundamental concepts of stress and strain and the relationship between both through the strain-stress equations in order to solve problems for simple tridimensional elastic solids
CLO8. Apply and demonstrate the principles and tools of Strength of Materials in the analysis and solution of equilibrium problems based on a real-world scenario.
CLO9. Solve problems relating to torsional deformation of bars and other simple tri-dimensional structures
CLO10. Explain the concept of buckling and be able to solve the problems related to isolated bars

COURSE SYLLABUS

Week	Topic	Topic details	Related LO and Reference (Chapter)	Proposed assignments
Statics				
1	General Principles	• Mechanics • Fundamental Concepts • Units of Measurement	CLO1	

Week	Topic	Topic details	Related LO and Reference (Chapter)	Proposed assignments
		• The International System of Units • Numerical Calculations • General Procedure for Analysis		
2	Force Vectors	• Scalars and Vectors • Vector Operations • Vector Addition of Forces • Addition of a System of Coplanar Forces • Cartesian Vectors • Addition of Cartesian Vectors • Position Vectors • Force Vector Directed Along a Line • Dot Product	CLO2	
3	Equilibrium of a Particle	• Condition for the Equilibrium of a Particle • The Free-Body Diagram • Coplanar Force Systems • Three-Dimensional Force Systems	CLO3	
4	Force System Resultants	• Moment of a Force – Scalar Formulation • Cross Product • Moment of a Force–Vector Formulation • Principle of Moments • Moment of a Force about a Specified Axis • Moment of a Couple • Simplification of a Force and Couple System • Further Simplification of a Force and Couple System • Reduction of a Simple Distributed Loading	CLO3	
5	Equilibrium of a Rigid Body	• Conditions for Rigid-Body Equilibrium • Free-Body Diagrams • Equations of Equilibrium • Two- and Three-Force Members • Free-Body Diagrams • Equations of Equilibrium • Constraints and Statical Determinacy	CLO4	
6	Center of gravity and Centroid	• Center of Gravity, Center of Mass, and the Centroid of a Body • Composite Bodies • Resultant of a General Distributed Loading	CLO5	
7	Moment of inertia	• Definition of Moments of Inertia for Areas • Parallel-Axis Theorem for an Area • Radius of Gyration of an Area • Moments of Inertia for Composite Areas	CLO5	

Week	Topic	Topic details	Related LO and Reference (Chapter)	Proposed assignments
8				
9	Internal forces	• Internal Loadings Developed in Structural Members • Shear and Moment Equations and Diagrams • Relations between Distributed Load, Shear, and Moment.	CLO6	
10	Stress & strain	• Review equilibrium equations • Review internal forces • Normal stress • Shear stress • Single shear • Double shear • Factor of safety	CLO7	
11	Mechanical Properties of Materials	• Stress strain diagram (elastic vs inelastic) • Hooke's law • Poisson effect • Shear response	CLO7	
12	Axial Load	• Saint-Venat's Principle • Elastic Deformation of an axially loaded member • The force of Analysis axially loaded member. • 12.8 stress concentration.	CLO7	
13	Bending	• Bending kinematics • Flexure formula • Unsymmetric bending	CLO8	
14	Torsion	• Torsion kinematics • Torsion formula • Polar moment of inertia • Power transmission • Angle of twist	CLO9	
15	Column buckling	• Critical load • Euler equation • Differing supports	CLO10	
16	**Final Exam**			

COURSE LEARNING RESOURCES

Teaching will be achieved using available resources including Lectures, data show and materials uploaded to the e-learning system and term projects

ONLINE RESOURCES

https://www.youtube.com/playlist?list=PLOAuB8dR35oft2ZLc1sHseypNMAiG_TeJ
https://www.youtube.com/playlist?list=PLOAuB8dR35oft2ZLc1sHseypNMAiG_TeJ

ASSESSMANT TOOLS

ASSESSMENT TOOLS	%
Projects and Quizzes	20
Mid Exam	30
Final Exam	50
TOTAL MARKS	100

THIRD: COURSE RULES

ATTENDANCE RULES

Attendance and participation are extremely important, and the usual University rules will apply. Attendance will be recorded for each class. Absence of 10% will result in a first written warning. Absence of 15% of the course will result in a second warning. Absence of 20% or more will result in forfeiting the course and the student will not be permitted to attend the final examination. Should a student encounter any special circumstances (i.e. medical or personal), he/she is encouraged to discuss this with the instructor and written proof will be required to delete any absences from his/her attendance records.

GRADING SYSTEM

Example:

Grade	points
-	

REMARKS

Use of Mobile Devices, Laptops, etc. During Class, unexpected noises and movement automatically divert and capture people's attention, which means you are affecting everyone's learning experience if your cell phone, laptop, etc. makes noise or is visually disturbing during class. For this reason, students are required to turn off their mobile devices and close their laptops during class.

Academic Integrity. Copying assignments, allowing assignments to be copied, will fail the assignment on the first offense. Cheat in tests, or copying assignments for the second time.

Cite all sources consulted to any extent (including material from the internet), whether or not assigned and whether or not quoted directly.

Project: Students will undertake a term project to study in detail one of the course topics. The project may involve a critical literature review or a case study. The students should consult at least five (5) references or journal articles. A written project report of 10 pages maximum will be submitted in nominated dates. Ten-minute presentation will be given to the rest of the class during the last two weeks of the semester.
Formats, Rules, Topics, submission and presentation dates are illustrated in project form.

COURSE COORDINATOR

Course Coordinator	**Department Head:**
Signature:	**Signature:**
Date:	**Date:**