COURSE DESCRIPTION TEMPLATE FOR GRADUATE STUDIES

Faculty: **Engineering and Technology**
Department: **Mechanical Engineering**

COURSE TITLE	**Continuum Mechanics**	**COURSE CODE**	**0904707**
LECTURER(S)		**EMAIL:**	
CREDITS	**3**	**PRE-REQUISITE(S)**	**-**
DURATION OF COURSE	**4 months**		

OBJECTIVES:
The main objectives of the course are:

1. Developing the main continuum concepts, mainly the algebra and calculus of tensors
2. Deriving and using the universal laws and constitutive laws in both symbolic and indicial notation.
3. Developing the main principles of stress, strain, and motion kinematics
4. Building a foundation for important mechanics topics such as elasticity, plasticity, viscoelasticity , composite materials, and fluid mechanics.

INTENDED LEARNING OUTCOMES:

Subject Specific Skills:

At the end of the course students will be able to:
1. Deal with symbolic, indicial and matrix notation of tensors
2. Perform stress, strain and deformation analysis of deformable bodies
3. Apply the concepts of continuum mechanics to advanced case of elasticity and fluid flow

Core Academic Skills: At the end of the course, students are expected to:
1. Acquire the mathematical principles of advanced mechanics courses
2. Develop the basic skills of engineering research

Personal and Key Skills: At the end of the course, students are expected to
1. Use symbolic, indicial and matrix notations of tensors
2. Analyze the motion, stress and strain of deformable bodies under different loads
3. Develop the necessary skills for more advanced course

LEARNING/TEACHING METHODS:
1. Lectures
2. Internet material
3. Seminars by students

ASSIGNMENTS:
1. Problem Solving
2. Internet and Reference Search on Specific Topics
3. Presentations

ASSESSMENT:

Mid-Term Exam	30 %
Term Paper	15 %
Assignments	15 %
Final Exam	40 %

SYLLABUS PLAN:

Week	Topic	Hrs.	Comments
1	Introduction and basic concepts of continuum mechanics	3	
2	Tensors: rank, symbolic notation, index notation.	3	
3	Matrix representation of tensors	3	
4	Transformation laws and matrices of Cartesian tensors	3	
5	Eigenvalue problem, Eigen vectors	3	
6	Tensor Calculus, integral theorems	3	
7	Stress Principles, Stress Vector, Stress Tensor	3	
8	Equilibrium Equations, Stress Transformation, Principal Stresses	3	
9	Kinematics, Deformation, and Motion. Lagrangian and Eulerial descriptions of motion	3	
10	Finite Strain Tensors. Infinitesimal Strain Tensor. Principal Strains	3	
11	Stretch ratios. Velocity gradients. Rotation Tensor	3	
12	Fundamental Laws of Continuum Mechanics. Continuity Equation. Linear Momentum Principle. Angular Momentum Principle.	3	
13	Energy Conservation, Constitutive laws.	3	
14	Introduction to linear elasticity theory. Tensor of elastic coefficients.	3	
15	Generalized Hooke's law. Plane Stress and Plane Strain analysis.	3	
16	Elastostatic and Elastodynamic Problems.	3	

INDICATIVE BASIC READING LIST/RELATED WEBSITES:

1. G.E. Mase and G.T. Mase, Continuum Mechanics for Engineers. CRC.
2. T.J. Chung , Continuum Mechanics. Prentice Hall.
3. A.J.M. Spencer, Continuum Mechanics. Longman.
4. G.E. Mase, Continuum Mechanics (Shaum's Outline Series). McGraw Hill.
5. Y. C. Fung, A First Course in Continuum Mechanics. Prentice Hall.
6. L. Malvern, Introduction to the Mechanics of a Continuous Medium. Prentice Hall.