RAFFLES UNIVERSITY

Japanese Zone, NH-48, Neemrana-301705

Ph.D. Course Work Syllabus

Paper-II Civil Engineering

Paper Code-(Ph.D.-102)

Contact Hours: 4 Hrs/ week **Continuous Assessment: 40 Marks**

Credit: 4 **End Term Exam: 60 Marks**

Unit – I

Two-dimensional problems in rectangular coordinates Plane stress;

Plane strain; Differential equations of equilibrium; Boundary conditions; Compatibility equations; Stress function; Governing differential equation; Solution by Polynomials; End effects – Saint-Venart's Principle; Determination of displacements; Bending of a cantilever loaded at the end; Bending of a beam by uniform load.

Unit – II

wo-dimensional problems in polar coordinates General equations in polar coordinates;

Stress distribution symmetrical about an axis; Effect of circular holes on stress distribution in plates; Concentrated force at a point of a straight boundary; Concentrated force acting on a beam; Stresses in a circular disc, general solutions of the two-dimensional problem in polar coordinates, applications of the general solutions in polar coordinates.

Unit – III

Analysis of stress and strain in three dimensions Stress at a point – components of stress;

Principal stresses; Stress ellipsoid and stress director surface; Determination of principal stresses; Stress invariants; Determination of maximum shear stresses; Octahedral shear stress; strain at a point – Components of strain; differential equations of equilibrium, the principle of superposition

Unit – VI

Strain Energy Methods Total strain energy; Principle of virtual work;

Griffith's theory of rupture; Castigliano's theorem; Principle of least work (Stationary potential energy), applications of the principle of least work rectangular plates, shear lag.

Unit – V

Torsion: Torsion of straight bars – Saint Venant's theory;

Elliptic cross section; Membrane analogy; Torsion of a bar of narrow rectangular cross-section; Torsion of rolled profile sections; Torsion of thin tubes. Plasticity: Plastic Deformation: Strain Hardening, Idealized Stress- Strain curve, Yield Criteria, von Mises Yield Criterion, Tresca Yield Criterion, Plastic Stress-Strain Relations, Principle of Normality and Plastic Potential, Isotropic Hardening.

TEXT BOOKS:

1. Advanced Mechanics of Solids, Srinath L.S., Tata McGraw Hill,2000.
2. Theory of Elasticity, Timoshenko S. and Goodier J. N., McGraw Hill, 1961.
3. Solid Mechanics, Kazimi S. M. A., Tata McGraw Hill,1994.
4. Theory of Elasticity, Sadhu Singh, Khanna Publishers, 2003.

REFERENCE BOOKS:

1. Elasticity, Sadd M.H., Elsevier, 2005.
2. Engineering Solid Mechanics, Ragab A.R., Bayoumi S.E., CRC Press,1999.
3. Computational Elasticity, Ameen M., Narosa, 2005UNIT-V.