II Year I Semester	L	T	P	To	C
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AG205 Strength of Materials and Design of Structures

Course Description & Objectives:

To study the microstructure of various ferrous and non ferrous alloys, to evaluate the mechanical properties of materials and to analyze the structures for design capabilities.

Course Out Comes :

After course completion students would have:

1. *the understanding of the primary concepts of stress and strain for different materials in mechanics of solids and structures.*
2. *ability to determine shear forces, bending moments and axial forces.*
3. *knowledge about RCC beam as well as compression bending of beams.*

Unit I: Stress and Strain:

Elasticity–Stresses and strains Elastic limit–Elastic constants Lateral strain Composite sections Temperature stresses Volumetric strain in a body Resilience and strain energy.

Unit II: Shear force and Bending Moments:

Analysis of statically determinate beams Shear force and bending moment diagrams, Bending and shearing stresses in beams – slope and deflection of beams using double integration method, Macaulay's method, Moment area theorems and conjugate beam method.

Unit III: Columns and Beams:

Combined bending and direct stresses Columns and struts Euler's theory Empirical formulae for loads on columns; Stresses in thin cylindrical shells – Torsion of shafts and springs; Analysis of statically indeterminate beams, Propped beams, fixed and continuous beams – Analysis using superposition, Three moment equation and moment distribution methods.

Unit IV: RCC Beams:

Analysis and design of singly reinforced and doubly reinforced beams – Shear, bond and torsion – Design of T beams – Slabs – Design of one way and two way slab (IS code method only) – Columns, Foundations, Retaining walls, Silos and Ferro cement tanks.

Unit V: Riveted and Welded Joints:

Loads and use of BIS codes Design of riveted and welded connections – Design of structural steel members in tension, compression and bending.

TEXT BOOKS:

1. Bansal, R.K. (1992). Engineering Mechanics and Strength of materials. Laxmi Publications, New Delhi.
2. Punmia, B.C., Ashok Kumar Jain and Arun Kumar Jain. (1994). Reinforced Concrete Structures (Vol. I). Laxmi Publications, New Delhi.

REFERENCES:

1. Raghupathi, M. (1998). Design of Steel Structures. Tata McGraw Hill Publishers.
2. Ramamrutham, S. and Narayan, R. (1995). Design of Steel Structures. Dhanpat Rai and Sons, Delhi.
3. Ramamrutham. S. (1984). Engineering Mechanics and strength of Materials. Dhanpat Rai and Sons, Nai Sarak, NewDelhi.
4. Ramamrutham. S. and Narayan. R. (1997). Strength of Materials. Dhanpat Rai and Sons, Nai Sarak, New Delhi.
5. Sushil Kumar. (1991). Treasure of R. C. C. Design. Standard Book House, Delhi.
6. Vazirani, V. N. and Ratwani, M. M. (1991). Analysis of Structures (Vol. I and II). Khanna Publishers, Nai Sarak, New Delhi.
7. Junnarkar, S.B. (1995).Mechanics of structures (Vol. I and II). Charotar Pub. House, Anand.
8. Khurmi, R.S. (1996)Strength of Materials. S. Chand and Company Limited, New Delhi.
9. Kumar, K. L. (2003). Engineering Mechanics. Tata Mc Graw Hill Publishing Company, New Delhi.
10. Gurcharan Singh. (1986). Theory and Design of R.C.C.Structures. Standard Publishers and Distributors, New Delhi.
11. http://nptel.ac.in/courses/105105108/

RAPTURE STRENGTH Rapture strength is the strength of the material at rupture. This is also known as the breaking strength. MODULUS OF RESILIENCE Modulus of resilience is the work done on a unit volume of material as the force is gradually increased from O to P, in Nm/m3.Â Solution 205 Shearing Deformation Shearing forces cause shearing deformation. An element subject to shear does not change in length but undergoes a change in shape. The change in angle at the corner of an original rectangular element is called the shear strain and is expressed as The ratio of the shear stress and the shear strain Î³ is called the modulus of elasticity in shear or modulus of rigidity and is denoted as G, in MPa. Strength of Materials focuses on the strength of materials and structural components subjected to different types of force and thermal loadings, the limiting strength criteria of structures, and the theory of strength of structures. Consideration is given to actual operating conditions, problems of crack resistance and theories of failure, the theory of oscillations of real mechanical systems, and calculations of the stress-strain state of structural components. Strength of Materials is a translation of the peer-reviewed Ukrainian journal Problemy Prochnosti. The Russian-language edition is pu Materials Engineering â€“ On the basis of these structure-property correlations, designing or engineering the structure of a material to produce a pre-determined set of properties. Structure Structure of a material usually relates to the arrangement of its internal components. Â· Subatomic - Structure involves electrons within the individual atoms and interactions with their nuclei.Â Classification of Materials. Solid materials have been conveniently grouped into three basic classifications: (1) metals, (2) ceramics, and (3) polymers.Â Properties-Â· Relatively stiff and strongâ€”stiffnesses and strengths are comparable to those of the metals , very hard, extremely brittle (lack ductility),.highly susceptible to fracture.Â FCC Ag, Au, Cu (111). [112]. (Twin planes and Twin directions). ag205.pdf - Free download as PDF File (.pdf), Text File (.txt) or read online for free.Â Tata Mc Grawâ€Hill Pub. Co., New Delhi. (AC201) STRENGTH OF MATERIALS AND DESIGN OF STRUCTURES L T P To C 3 1 - 4 4 UNIT I Elasticityâ€“Stresses and strainsâ€Elastic limitâ€“Elastic constantsâ€Lateral strainâ€ Compositesectionsâ€Temperature stressesâ€Volumetric strain in a bodyâ€ Resilience and strain energy. UNIT II Analysis of statically determinate beamsâ€ Shear force and bending moment diagrams, Bending and shearing stresses in beams â€“ slope and deflection of beams using double integration method, Macaulayâ€™s method, Moment area theorems and conjugate beam method. In the design of structures and machines, the application of the principles of strength of materials is necessary if satisfac-tory materials are to be utilized and adequate proportions obtained to resist functional forces. Forces are produced by the action of gravity, by accelerations and impacts of moving parts, by gasses and fluids under pressure, by the transmission of mechanical power, etc.Â Strength of materials. 205. Table of Simple Stresses (Continued). Illustration.