
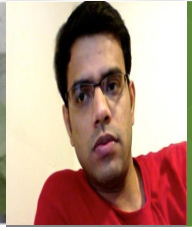

THEORY OF ELASTICITY

PROF. BISWANATH BANERJEE
PROF. AMIT SHAW
Department of Civil Engineering
IIT Kharagpur

PRE-REQUISITES : Engineering Mechanics

INTENDED AUDIENCE : Civil Engineering, Mechanical Engineering, Aerospace Engineering, Naval Architecture, Applied Mechanics

INDUSTRIES APPLICABLE TO : Any Civil, Mechanical and Aerospace company

COURSE OUTLINE :
In this course the concept of elasticity, an important property of solids will be discussed in a comprehensive way. Idealization of physical system, representing the idealized system through mathematical equation and finally finding solution of those equations are the key features that constitute the structure of this course. In this course emphasis will be given on both theory and applications.

ABOUT INSTRUCTOR :
Prof. Biswanath Banerjee is presently an Assistant Professor in the Department of Civil Engineering, IIT Kharagpur. He obtained his Bachelors degree in Construction Engineering from Jadavpur University in 2000, MTech in Structures from IIT Kharagpur in 2004 and PhD in Computational Mechanics from IISc Bangalore in 2009. Prior to joining IIT Kharagpur, Professor Banerjee spent two years as Post-doctoral Research Fellow in Cornell University, USA. He has also spent for some time in industries like Gammon India Limited, TRF Limited (A Tata enterprise) and Research labs in SERC Chennai (A CSIR Unit) as a Scientist. Professor Banerjees research area is in the field of Computational Mechanics and Reverse Engineering Problems.

Prof. Amit Shaw is presently an Associate Professor in the Department of Civil Engineering, IIT Kharagpur. He obtained his Bachelors degree in Civil Engineering from IIEST Shibur (formerly Bengal Engineering College Shibpur) in 2000, MTech in Structures from IIT Roorkee in 2003 and PhD in Computational Mechanics from IISc Bangalore in 2007. Prior to joining IIT Kharagpur, Professor Shaw spent two years as Research Fellow in University of Aberdeen, UK. He also worked for some time in industries like Gammon India Limited and L&T ECC.

COURSE PLAN :

Week 1: Mathematical Preliminaries Introduction to Tensor

Week 2: Concept of Stresses and Strains

Week 3: Material Behaviour– 1 General anisotropic material, strain energy density, constitutive relation

Week 4: Material Behaviour– 2 Material symmetry, linear elastic material, Generalized Hook's law

Week 5: Formulation of boundary value problems in elasticity Equilibrium, compatibility, formulation in Cartesian and Polar coordinates

Week 6: Solution of boundary value problems in elasticity– 1 Plane stress and plane strain problems

Week 7: Solution of boundary value problems in elasticity– 1 Problems in flexure

Week 8: Solution of boundary value problems in elasticity– 1 Problems in Torsion

Week 9: Introduction to Thermo-elasticity

Week 10: Introduction to photo-elasticity

Week 11: Introduction Nonlinear elasticity

Week 12: Introduction to photo-elasticity