# ME 6769: Linear Elasticity

*Offered Every Fall*

**Credit Hours**: 3-0-3

**Prerequisites**: Knowledge of strength of materials and differential equations is required to take the class. Knowledge of continuum mechanics is strongly recommended.

**Catalog Description**: Governing equations of linear elasticity, plane elasticity, boundary value problems, Airy stress function and complex variable methods, simple three-dimensional solutions. Crosslisted with AE 6769.

**Textbooks**: Jacqueline R. Barber, Elasticity, Kluwer Academic Publishers, 1992.

**Instructors**: Iwona Jasiuk (ME), Chris Lynch (ME), Richard Neu (ME), Jianmin Qu (ME), Min Zhou (ME), Sathyanaraya Hanagud (AE)

**References**:

- A.P. Boresi and K.P. Chong, Elasticity in Engineering Mechanics, Elsevier, 1987.
- A.E. Green and W. Zerna, Theoretical Elasticity, 1968.
- R.W. Little, Elasticity,1973.
- A.E.H. Love, A Treatise on the Mathematical Theory of Elasticity, 1944.
- N. Muskhelishvili, Some Basic Problems of the Mathematical Theory of Elasticity, 1953.
- I.S. Sokolnikoff, Mathematical Theory of Elasticity.

**Audience**: First year graduate students in ME, AE, CE, and MSE.

**Goals**: This class will introduce governing equations of linear elasticity and will focus on solutions of boundary value problems in both two and three dimensions using several different methods.

**Topics**:

- Governing Equations of Linear Elasticity
- (Review of Continuum Mechanics Concepts)
- Traction, stresses, equilibrium equations (2h)
- Deformation, strains, compatibility conditions (2h)
- Constitutive equations (1h)
- Boundary conditions (1h)
- Uniqueness of Solution
- St. Venant Law
- Plane Elasticity
- Plane stress and plane strain (1h)
- Airy stress function method (20h)
- Problems in Cartesian coordinates (4h)
- Problems in polar coordinates (14h)
- Curved beams (1h)
- Michells general solution (2h)
- Inclusion problems (3h)
- Contact problems (3h)
- Singular solutions (5h)
- (Flamant solution, crack tip fields, dislocations)
- Greens function method (2h)
- Complex variables method (3h)
- Dundurs constants (1h)
- Three-dimensional Elasticity
- Displacement potentials method (2h)
- Radial symmetric problems (4h)
- Torsion of prismatic bars (4h)