ME 254 (JAN) 3:0 Compliant Mechanisms

Systematics and mobility analysis of compliant mechanisms. Discrete and distribute compliance. Methods of elastostatic and elastodynamic analysis including multi-axial stiffness, pseudo-rigid-body, and spring-mass-lever models. Non-dimensional analysis of compliant topologies. Energetics including mechanical advantage and efficiency; static and dynamic balancing; bistability and multistabillity. Synthesis and design methods including rigid-body replacement, topology optimization, building blocks, constraint theory, and selection maps. Applications in automotive, aerospace, biomedical, consumer products, and microelectromechanical systems.

Instructor: G. K. Ananthasuresh

References

1. NPTEL MOOC: https://nptel.ac.in/courses/112/108/112108211/
2. Instructor's notes.
3. L. L. Howell, Compliant Mechanisms, Wiley, 2001.

Pre-requisites

Multivariable calculus and programming experience in MATLAB are preferred. Familiarity with kinematics and mechanisms is recommended.

Additional information

This course is open to doctoral and master's students interested in structural mechanics and optimization. Undergraduate students with sufficient background can approach the instructor for permission.

Course objectives

After taking this course, the students will be able to:

1. Understand and appreciate the compliant-and-strong paradigm in the design of mechanical components.
2. Analyze and synthesize compliant mechanisms using a variety of methods.
3. Design compliant mechanisms systematically for a variety of applications including automotive and aerospace structures and mechanisms, microelectromechanical systems, biomedical devices, and consumer products.

Course website: https://mecheng.iisc.ac.in/suresh/me254