Course Number: 28559

Course Name: Analytical Dynamics

Course Type: Theory	Type & Max Unit: Constant 3
Prerequisite:	Corequisite: Advanced Dynamics
Level: Graduate	First Presentation:
Group: Dynamics and Vibrations	Last Edition: 2018

Objectives:

This course teaches students different analytical approaches for derivation of governing equations of motion for constrained dynamical systems including Lagrange, Hamilton, Kane, Gibbs-Appell, and Boltzmann–Hamel approaches.

Topics:

1. Introduction (Generalized Coordinates, Virtual Displacements, Virtual Work, Generalized Force)
2. Hamilton's Principle (Dynamics of rigid and flexible systems)
3. Lagrange's Method (Integrated Multipliers Method, Augmented Method, Embedding Method, Elimination Method, Modified Lagrange Method)
4. Hamilton Canonical Equations of Motion and Routh Method
5. Quasi Coordinates
6. Gibbs-Appell Method
7. Kane's Method
8. Extra (Not Required): Quaternions Versus Euler Angles, Jourdain's Principle, Maggi's Equations, Boltzmann–Hamel Equation, Volterra's Equation, Ignorable Coordinates and Routh Method, Gauss's Principle and Udwadia's Method,

References:

1- **JERRY H. GINSBERG, Advanced Engineering Dynamics, Second Edition, Transferred to digital printing 2010, Cambridge University Press.**
2- **Haim Baruh, ANALYTICAL DYNAMICS, 1999, McGraw-Hill.**
3- **Greenwood, D. T. (2003). Advanced dynamics (p. 39). Cambridge: Cambridge University Press.**
4- **A.W. Marris and C. E.Stoneking, "Advanced Dynamics", McGraw- Hill Book Co.**
5- **T.R. Kane and D.A. Levinson, "Dynamics: Theory and Application", McGraw- Hill Publishing Co.**
6- **L. Meirovitch, "Methods of Analytical Dynamics", McGraw-Hill Book Co.**