ICxxx Railway Vehicle Dynamics

Objective: The primary objective of this course is to study the computational multibody-syste approaches and discusses the study of derailment, design issues, and performance evaluation o railway vehicle systems

Outcome: The students will be able to develop nonlinear and linearised model of railway vehicle systems

Introduction: Railroad Vehicles and Multibody System Dynamics, Constrained Dynamics, Geometr Problem, Contact Theories, General Multibody Railroad Vehicle Formulations, Specialized Railroa Vehicle Formulations, Linearized Railroad Vehicle Models

Dynamic Formulations: General Displacement, Rotation Matrix, Velocities and Accelerations, Newto Euler Equations, Joint Constraints, Augmented Formulation, Trajectory Coordinates, Embedding Technique, Interpretation of the Methods

Contact and CreepForce Models: Hertz Theory, Creep Phenomenon, WheelRail Contact Approaches CreepForce Theories

Implementation and Special Elements: General Multibody System Algorithms, Numerical Algorithms Constraint Formulations, Numerical Algorithms Elastic Formulations, Calculation of the Creep Forces, Higher Derivatives and Smoothness Technique, Track Preprocessor, Deviations and Measured Data, Special Elements, Static Analysis

Estimation and control: Parameter Estimation Methods, Minimizing Prediction errors, Linear Regression and recursive Least Square method, Adaptive control, auto tuning and gain scheduling, predictive control methods.

Reference Books:

1. S.D. Iwnicki, Handbook of Railway Vehicle Dynamics. CRC Press, 2006

2. A.H. Wickens, Fundamentals of Rail Vehicle Dynamics: guidance and stability, Loughborough University, UK, 2003

3. Ahmed A. Shabana, Khaled E. Zaazaa, Hiroyuki Sugiyama, "Railroad Vehicle Dynamics: A Computational Approach", CRC Press, Dec-2010

Mrs. RB 14.2.14

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