Integrating Rigid Body Dynamics & Vibrations: An Introductory Course for Undergraduate Civil Engineers

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Abstract — *The civil and mechanical engineering departments at Texas A&M have adopted a course in Dynamics & Vibrations as the standard introductory undergraduate dynamics course. Dara W. Childs developed the original concept, course and textbook. The course was developed based on the following premises: (i) dynamics is the development of models for particles and rigid bodies, and (ii) a valid model requires general kinematics equations and differential equations of motion. Vibrations topics and examples, including multi degree of freedom problems, are integrated throughout the course. The course emphasizes model development and the use of general kinematic equations and differential equations of motion; MATLAB™ is used extensively for solving the equations of motion.*

The first two authors have adapted the course content to incorporate civil engineering examples and applications, and to place more emphasis on vibration. Course projects are based on realistic civil engineering examples, with an emphasis on the assumptions required to develop the analytical model. The projects are team assignments and rely on numerical analysis, a co-requisite for the course. The increased emphasis on the vibration material keeps our civil engineering students more engaged in the course. This paper presents the original course design, the adaptation of the course for civil engineering students, and the implementation of the course as a requirement for all civil engineering undergraduate students. Course materials (including projects); data on student acceptance and performance; and the course assessment and evaluation materials used will be addressed in the paper.