26 April 2011

Hi,

This note is primarily written for persons who are interested in teaching a Dynamics/Vibrations course from the book, *Dynamics in Engineering Practice* (2010), CRC Press, Taylor and Francis Group, ISBN # 978-1-4398-3125-0.

First, thanks for your interest!

I developed the book for a required junior course in Dynamics and Vibrations at Texas A&M University. Our program (more or less) followed the traditional statics-dynamics sequence until 2000. Those courses were followed by two "systems" courses that covered vibrations (through multi degrees of freedom) and controls. In the late 1990s, the State of Texas decreed that we cut the number of courses in our program. The three courses that the faculty designed to replace the previous four courses were:

1. A combined statics (~2/3) and particle dynamics (~1/3) course in the sophomore year concurrent with differential equations.
2. A combined dynamics/ mechanical vibrations course in the 1st semester of the junior year with differential equations as a prerequisite (MEEN 363).
3. A combined systems (other than mechanical) and controls course (MEEN 364).

Before the change, we were using Meriam's excellent classic dynamics books for an outline and problem source. However, we were teaching quite different skills from those presented by Meriam, namely, development of models for predicting motion. Also, in teaching kinematics, we were proceeding from geometric relationships followed by differentiation to obtain velocity and acceleration relationships, versus a classic vector approach.

The book is aimed at teaching students modeling skills and views differential equations as the essential basis for dynamics and vibrations. *This book is not suited for a traditional statics-dynamics sequence.*

MEEN 363 has been taught (successfully) by a range of faculty members from senior staff members to new assistant professors. In a pinch, one summer, a PhD candidate taught the course. The grade distributions for MEEN 363 are comparable to other required junior-level courses. As you can see from the syllabus and course outline that are included, the course features five (2-hour) evening exams plus a non- cumulative (2-hour) final. This is the only coercive feature in the course. Without the exam pressure, most of our students would fall behind and perform poorly. An in-class review session is provided before the exams.

In the transition from the old curriculum to the new, differential equations was a co-requisite instead of a prerequisite. In those circumstances, we taught particle and planar kinematics first. When we then started with particle kinetics, the students had an adequate background in differential equations. Obviously, that option continues to be available in using the book for a course at your school.

The Civil Engineering course in strength of materials is also a prerequisite for MEEN 363. However, I occasionally allow students to take the course without it since formal problems that involve beams and torsion mainly show up later in the semester.

Starting a dynamics book with differential equations as a prerequisite is a distinctly liberating experience. With that starting point classical vibration problems are a natural starting point for teaching free-body diagrams as the basis for deriving equations of motion. The book presents Newtonian and Energy approaches for deriving equations of motion for 1DOF particles separately; however, they are presented in parallel in the course. The same example is attacked in the same lecture using both methods.

The book has many examples that are largely differential-equation problems. From the outset, we discovered that students had weak backgrounds in the subject. The TAMU course covers a wide range of topics without any particular emphasis. Typically, our students are unclear on homogeneous, particular, and complete solutions; hence, we spend time on these subjects that could (in a perfect world) be spent on dynamics.

The following materials are provided from my presentation of MEEN 363 in the fall semester of 2010:

1. Course outline (schedule).
2. Course syllabus
3. ABET course syllabus
4. Pdf versions of the lectures. I started this book in Word Perfect (WP). My lectures are in WP.
5. WORD version of the lectures. I paid an Aggie undergraduate to produce a WORD version of the lectures. You are welcome to modify and use these lectures as you see fit. Note that the equation numbers may not coincide with the book.
6. A copy of the tests.
7. A listing of problems assigned for homework.

I have also attached a supporting MATLAB book. I paid a graduate student to develop this material several years ago. We have not used it as much to support the course as I had expected.

My friend Dr. Andrew Conkey (Texas A&M University at Qatar) wrote the problems for the book. In some cases, he started with problems that I had developed. In other cases, he developed new problems. (Andy's solution manual is available from the publisher.) I gave the publisher a WP version of the book, which they converted to WORD. Andy worked in WORD from the start. We both started with errors, and the conversion of my WP materials to WORD introduced new errors. The attached errata contain all of the *known* errors in the 1st printing. Many of the errors were found by motivated ($10 / error) Aggie students.

I am sorry for the errors. I used Meriam's book for roughly 30 years and never found one error. We will continue to search for errors, and I would appreciate your bringing any new errors that you find to my attention.

In closing, let me pass along one anecdote regarding the book. Around five years ago, I had a student come by my office in the fall to pick up his graded spring final. He had spent the summer as an intern in Kansas City, working for a large oil company along with other junior students from "Big 12" schools. As the summer went on, dynamics and vibrations issues arose

at work, and he (generally alone) understood the terminology and issues. His compatriots asked where he had acquired his knowledge, and he replied that he had just completed MEEN 363. At their request, he brought the book and his notes in for review over a lunch hour. After reviewing the material they told him, "We are never going to cover this material." I suspect that some of the students eventually covered portions of the material. We think that the MEEN 363 knowledge, *and skills* are essential for an M.E. graduate. The course and the book have been effective in conveying them to Aggie students.

Please contact me (dchilds@tamu.edu 979 845 6666) if you have any questions.