1st Printing Errata as of Monday, September 18, 2000

Inside front cover: 2nd line up from the bottom the value for ω_d is missing a sub *n* and should be $\omega_d = \omega_n \sqrt{1-\zeta^2}$

p. xiv Add the following text:

Insert A:

Dr. Mark Schulz of North Carolina A & T State University provided the material for Section 7.8 on operational deflection shapes for which I am grateful.

Insert B (as a separate paragraph)

Special thanks is owed Dr. Sergio Preidikman, Departamento de Ingeniería Mecánica, Universidad Nacional de Río Cuarto, Argentina for the business jet mesh on the cover. This is a model used in his Ph.D. dissertation in Engineering Mechanics at Virginia Tech (a student of Prof. D. T. Mook) to perform aeroelastic simulations. Thus it is not just a nice drawing but represents a method for computing important phenomena, such as flutter, useful in the design of aircraft. Acknowledgment of this important contribution to the cover of this text was inadvertently left out of the first printing. Thank you Sergio.

p. 1: 11 lines down, second word in "and" should be "an"

p. 67: 9 lines down from top the expression for "$x(t)$ =…" should be replaced with

$$x(t) < \mu mg/k \text{ and } \dot{x}(t) = 0$$

p. 71: 8 lines down, change "**Example 10.1.2**" to "**Example 1.10.2**"

p. 78: problem 1.10: "indifferential" should be "in differential" (missing space)

p. 82: problem 1.50: "deteitnine" should be "determine"

p. 98: Line following eq. (2.25) change "$t = 2\pi/\omega$" to "$t = \pi/2\omega$"
Second line following eq. (2.25) sin and cos are reversed. The line should read:
"of sinωt must vanish. Similarly, …..coefficient of cosωt must vanish."

p. 102: Equation (2.32) place a comma just before the expression for θ

p. 103: On the vertical label on the top figure change "Amplitudde" to "Amplitude"

p. 109: Change the denominator of equation (2.37) by replacing λ with *k* to read

$$\theta = \tan^{-1}\frac{c\omega}{k - m\omega^2}$$

p. 130: In the line following equation (2.90) replace
"equation (2.95)" with "equation (2.90)"

p. 130: Equation (2.91) has a square missing on ω just inside the integral. The correct expression is

$$\Delta E = c\int_0^{2\pi/\omega}(\omega^2 X^2\cos^2\omega t)dt = \pi c\omega X^2$$

p. 164: Problem 2.66 change "(2.118)" to "(2.110)", change "*x*" to "*X*", and remove the subscript from ω.

p. 175: The solution to the example is incorrect, replace it with the following. The plot is correct. The incorrect solution should not have treated the impulse as a particular solution:

Solution By inspection, the natural frequency is ω_n = 2 rad/s. Examining the velocity coefficient yields that

$$2 = 2\zeta\omega_n \quad \text{or} \quad \zeta = 0.5$$

thus the system is underdamped and the response given in Window 3.1 applies.

Computing the damped natural frequency yields

$$\omega_d = \omega_n\sqrt{1-\zeta^2} = 2\sqrt{1-(\frac{1}{2})^2} = \sqrt{3}$$

First compute the response for the time interval $0 \le t < 4$ s. In this interval only the first impulse is active. The corresponding impulse solution is given by equation (3.6) to be

$$x_I(t) = \frac{\hat{F}}{m\omega_d}e^{-\zeta\omega_n t}\sin\omega_d t = \frac{1}{\sqrt{3}}e^{-t}\sin\sqrt{3}t\,, \quad 0 \le t < 4$$

The total solution for the first time interval is then equal to the sum of the homogenous and impulse solution. The homogenous solution is

$$x_h(t) = e^{-t}(A\sin\omega_d t + B\cos\omega_d t)$$

where *A* and *B* are the constants of integration to be determined by the initial conditions and the subscript *h* denotes the solution due to the initial conditions. Differentiating the displacement yields the velocity

$$\dot{x}_h(t) = -e^{-t}(A\sin\sqrt{3}t + B\cos\sqrt{3}t) + e^{-t}(\sqrt{3}A\cos\sqrt{3}t - \sqrt{3}B\sin\sqrt{3}t)$$

Setting $t = 0$ in these last two expressions and using the initial conditions yields the following two equations:

$$x_1(0) = 1 = B$$
$$\dot{x}_1(0) = -1 = -B + \sqrt{3}A$$

Solving for A and B and substituting back into the expression for $x_h(t)$ and adding the impulse response yields the total solution

$$x_1(t) = e^{-t}(\cos\sqrt{3}t + \frac{1}{\sqrt{3}}\sin\sqrt{3}t), \quad 0 \le t < 4$$

Next compute the response of the system to the second impulse, which starts at t =4 s. Using equation (3.9) with τ = 4 s, the response to the second impulse is

$$x_2(t) = \frac{\hat{F}}{m\omega_d} e^{-\zeta\omega_n(t-\tau)} \sin\omega_d(t-\tau) = -\frac{1}{\sqrt{3}} e^{-t+4} \sin\sqrt{3}(t-4),\ t > 4$$

The *Heaviside Step Function* defined by

$$\Phi(t-\tau) = \begin{cases} 0, & t < \tau \\ 1, & t \ge \tau \end{cases}$$

is perfect for writing functions that "turn" on after some time has evolved. Heaviside functions are also denoted $H(t - \tau)$. Using superposition, the total solution is $x = x_1 + x_2$, and the Heaviside function is used to denote that x_2 "starts" after τ =4, the solution can be written as:

$$x(t) = e^{-t}(\cos\sqrt{3}t + \frac{1}{\sqrt{3}}\sin\sqrt{3}t) - \left[\frac{e^{-(t-4)}}{\sqrt{3}}\sin\sqrt{3}(t-4)\right]\Phi(t-4) \text{ mm}$$

p. 227: Third line down from the figure caption change the sign on the term with α from "+" to "-". That is, change the term "$+\alpha x_1^3(t)$" to "$-\alpha x_1^3(t)$" in the equation for $\ddot{x}_2(t)$.

Four lines up from the bottom, in the second line of the Mathcad code at the equation: `t2: = 5`

p. 233: Problem 3.6, 2 lines down, change "masslessy" to "massless"
Problem 3.6, 5 lines down, change "cantitever" to "cantilever"

p. 242: 9 lines down from the top change "BTBI_3" to "VTBI_3"

p. 258: Window 4.1, 12 lines down add the ", even for repeated eigenvalues" after the phrase "The eigenvectors of *A* are orthogonal" to read:
"The eigenvectors of A are orthogonal, even for repeated eigenvalues "

p. 488: Problem 6.10, in the first line change "design a 1 m" to "design a 12.82 m"