DSP First ERRATA. These are mostly typos, double words, misspellings, etc. Underline is not used in the book, so I've used it to denote changes. *JMcClellan, February 22, 2002*

1. page xviii, line 23: ... conventional. Part of the reason for this ...
2. page xix, line 26: ...the contributions of our editor,...
3. page 5, after Eq. (1.2.2): ...that the output signal is always nonnegative and the large signal values...
4. page 6, Figure 1.5: The output of the block diagram should be labeled as $y(t) = \mathcal{T}\{x(t)\}$
5. page 8, line 2: ...that writes the number $x[n]$ onto the optical disc. *(no hat on x in $x[n]$.)*
6. page 13, Table 2.1: last entry: $\cos[2\pi(k + \frac{1}{2})] = -1$
7. page 17, footnote 4: The unit hertz (abbreviated Hz) was adopted in 1933...
8. page 20, line 8: ...does not change the value of the cosine.
9. page 56, Eq. (3.2.8) is missing $\frac{1}{2}$ in four places:
$$x(t) = \tfrac{5}{2}e^{j400\pi t} + \tfrac{1}{2}e^{j440\pi t} + \tfrac{1}{2}e^{j360\pi t} + \tfrac{5}{2}e^{-j400\pi t} + \tfrac{1}{2}e^{-j440\pi t} + \tfrac{1}{2}e^{-j360\pi t}$$
10. page 59, Fig. 3.8: The two-sided spectrum should use $\frac{1}{2}X_k$, so all the spectral lines are twice as big as they should be.
11. pages 60–61: Figures 3.9, 3.10 and 3.11 are incorrect. The plots are flipped from what they should be.
12. page 63, line 3: ...century. We will not present a detailed...
13. page 64, equation (3.4.5): This equation only needs to be written for $k \geq 0$, so it should read:
$$X_k = \begin{cases} \dfrac{4}{j\pi k} & k = 1, 3, 5, \ldots \\ 0 & k = 0, 2, 4, 6, \ldots \end{cases}$$
14. page 64, Fig. 3.12: The two-sided spectrum should use $\frac{1}{2}X_k$, so all the spectral lines are twice as big as they should be.
15. page 74, after Eq. (3.6.4): ...if we divide by 2π.
16. page 81, problem 3.11, equation (3.8.4): radians/sec
17. page 83, last line: ...with straight lines. Indeed, digital computers...
18. page 85, first line: We can also *compute* the values...
19. page 86, last line, first paragraph: if $\omega = 2000\pi$ rad/sec and $T_s = 1/20000$ sec...

20. page 88, last equation, second and third lines:
    $= A\cos(2\pi f_0 n T_s + 2\pi \ell \underline{n} f_s T_s + \phi)$
    $= A\cos(2\pi f_0 n T_s + 2\pi \ell \underline{n} + \phi)$

21. page 104, section 4.4.4, lines 1 and 2: ...is defined as a pulse consisting of first-order...

22. page 119, line 7: ...output is the sum of a finite number of weighted samples of the input...

23. page 120, line 4: ...while for reconstruction the opposite is true.

24. page 124, section 5.3, first line: ...special case of the general difference equation

25. page 129, sixth line of table, first entry: ...$2\delta[n-4]$

26. page 133, line 5 (`hh` in the third line of MATLAB code): `yy = conv(hh, xx);`

27. page 133, section 5.4, first line: ...definition of an FIR filter is

28. page 180, second line from bottom: ...and is zero whenever $11\hat{\omega}/2 = \pi k$, where k is...

29. page 183, `bb` in third line of MATLAB code: `H = freqz(bb,1,omega);`

30. page 190, section 6.8.1: Section title should be **6.8.1 Example: Lowpass Averager**

31. page 198, problem 6.11, part (e): Need period at the end of the sentence. ...$5\delta[n-3]$.

32. page 200, problem 6.18: Remove period at the end of the displayed equation

$$h_2[n] = \delta[n] - \delta[n-1] + \delta[n-2] - \delta[n-3]$$

33. page 219, Figure 7.3: Add $X(z)$, $W(z)$ and $Y(z)$ to the figure, underneath $x[n]$, $w[n]$ and $y[n]$.

34. page 225, line 5: ...Similarly, 60-Hz interference from...

35. page 233, line 9: ...on a polynomial $G(z)$:

36. page 239, Section 7.9: In the title: **7.9 PROPERTIES OF LINEAR-PHASE FILTERS**

37. page 239, Section 7.9.1: In the title: **7.9.1 The Linear-Phase Condition**

38. page 241, Section 7.9.2: In the title: **7.9.2 Locations of the Zeros of FIR Linear-Phase Systems**

39. page 240, line 6 from bottom: ...times a linear-phase factor...

40. page 241, three places: linear phase → linear-phase

41. page 242, line 4: ...are quite important because filter properties...

42. page 242, line 13: ... deals with common filters such as the first difference...

43. page 245, problem 7.8 part (d): From $H(z)$ obtain an expression...

44. page 245, problem 7.9, line 2: ... input to the second system and the overall...

45. page 246, problem 7.14:

$$H(z) = (1 + z^{-2})(1 - 4z^{-2}) = 1 - \underline{3}z^{-2} - 4z^{-4}$$

46. page 248, problem 7.17, part (b):

$$H(1/z) = -\underline{z^4} H(z)$$

47. page 248, problem 7.17, part (c): ..results for any M, i.e., both even and odd.

48. page 257, line 8 (value of $y[n]$ at $n = 1$): $10(0.8) - 15 = \underline{-7}$ $\qquad\qquad n = 1$

49. page 262, line before Example 8.4: ...numerator and denominator polynomials, respectively.

50. page 268, Example 8.5, second line: ...the impulse response of the system

51. page 269, Section 8.4, line 2: ... polynomials have zeros. These zero locations in the...
There are others on this page.

52. page 275, Figure 8.9 (top): y-axis label should be Magnitude

53. page 278, Figure 8.12: (top) y-axis label should be Magnitude;

54. page 289, Section 8.9.1: section title should be: z-**Transform of Second-Order Filters**

55. page 293, box: ...*the root either must be real or must occur...*

56. page 295, 2nd line from bottom: ...the poles may both be real or they may be a pair of...

57. page 319, Prob. 8.21(a), *delete duplicated phrase*:
Use z-transforms to show that the system function for the overall...

58. page 377, Prob. 9.10, *Add sampling rate information*:
Assume that a speech signal has been sampled at 8000 Hz and then analyzed with...

59. page 378, line 10, ... complex exponential $z = re^{j\theta} = r\cos\theta + jr\sin\theta$ provides a...

60. page 381, line 8: ...and may be either positive (counterclockwise) or negative (clockwise).

61. page 389, Fig. A.8 caption: ...the four vectors $\{1 + j, -1 + j, -1 - j, 1 - j\}$ by using...

62. page 390, item 2: ...drawn with its tail at the head of z_1 and its head at the head of z_2.

63. page 391, lines 2 and 3: ... we must decide whether or not $|z_1|$ and/or $|z_2|$ are greater than 1.
In Fig. A.10, it is assumed that both are larger than 1.

64. page 392, section A.5.5 title: **Geometric View of Inverse,** z^{-1}

65. page 392, Figure A.13 caption: ...complex number inverse $1/z$. For the vectors shown, $|z_1| < 1$...

66. page 393, section A.5.6 title: **Geometric View of Conjugate, z^***

67. page 398, Problem A.7: ...complex-valued expressions. Give your answers in polar form.

68. page 403, equation for `D`:

$$... = \begin{bmatrix} a_{1,1}b_{1,1} & a_{1,2}b_{1,2} \\ a_{2,1}b_{2,1} & a_{2,2}b_{2,2} \\ a_{3,1}b_{3,1} & a_{3,2}b_{3,2} \end{bmatrix}$$

69. page 404, last word in section B.3.1: ...of the plot window.

70. page 405,section B.4, line 1: ...pardigm of "functional programming" in which...

71. page 406, line 7: ...versus the pointwise exponential `(exp):`

72. page 409, item 2., line 6: ...and then definitions of the input...

73. page 412, 5 lines from bottom: ...Note that these last two statements process the entire matrix without ever using a `for` loop.

74. page 414, font in 2nd to last line: ...limited to `help`...

75. page 417, font in item 2. of section C.1.2.1: Explore the MATLAB `help` capability. Type...

76. page 420, item 2. last line of code should be `xx`, not `x`

77. page 421, last line of code on the page: `xx = cos(2*pi*f*tt);`

78. page 422, 5th line of code from bottom: `...makes the input vector xx into a column...`

79. page 424, item 1. 9 lines from bottom: You saw how easy it is for MATLAB...

80. page 427, first line: The goal of this laboratory is to gain familiarity...

81. page 429, item 3.: ...and plot the sum. Use `zcat` to show...

82. page 429, space in line 3 of item 4.: Use `zprint` to display the results...

83. page 433, line 2: ...synthesis program, or some other

84. page 436, line 4: (or A_4) because...

85. page 438, add semicolon to 10th line of code: `n1 = 1;`

86. page 456, line 1: The goals of this lab are...

87. page 456, 3rd line from bottom: ...is a vector containing samples of a cosine function.

88. page 458, equation (C.5.8) should have $1/L$, not $1/L + 1$:

$$y[n] = \frac{1}{L} \sum_{k=0}^{L-1} x[n-k]$$

89. page 460, line 3: ...xx_ so it can also be used...
90. page 460, item 2., line 3: ... label the x-axis to span the range $0 \leq n \leq 49$.
91. page 462, 2nd line from end: ...and by plotting the time-frequency response of the filter...
92. page 463, after eq. (C.6.1): ..gives a formula for computing the nth value...
93. page 464, 6 lines from bottom: ... Explain why this is so by stating a definition...
94. page 466, item 1. *remove indent and make into one paragraph*
95. page 473, last line in section C.7.1.6: ...can be compensated for by doubling...
96. page 481, 8 lines from bottom: ...that their pixel values are always non-negative...
97. page 486, last line: ...purpose we will use "Gaussian-shaped" functions...
98. page 491, line 6: ...they do. For an 8-bit
99. page 506, line 5: ...Use a power-of-2 FFT for efficiency.
100. page 512, Synthetic Strobe Movies (text line 2): ...effect on a_ rotating disk.
101. page 512, Linearity Property (text line 3): ...the blocks, the input, or
102. page 512, Time-Invariance Property *(capitalize P)*
103. page 512, Time-Invariance Property (text line 4): ...the blocks, the input, or
104. page 513, Introduction to FIR Filters *(capitalize F)*
105. page 513, Introduction to FIR Filters (text lines 2 and 3): ...lowpass filtering ... highpass filtering will
106. page 513, 7. Three-Domains (text line 3): ...the frequency domain, is illustrated with...
107. page 513, PeZ (text line 4): ...plots are displayed. When
108. page 513, PeZ (text line 6): ...plots are updated in
109. page 513, 8. Three-Domains (text line 3): ...the frequency domain, is illustrated with...
110. page 514, Music GUI (text line 3): ...synthesis, and viewing...
111. page 514, Complex Numbers via MATLAB *all caps for MATLAB*

112. page 514, Complex Numbers via MATLAB (text line 4): ...exponentials are handled by...

113. page 514, Z Drill (text line 4): ...conjugation, and inversion are covered.

114. page 515, Lab 1: Introduction to MATLAB *all caps for MATLAB*

115. page 515, Lab 1: Introduction to MATLAB (text line 2): *all caps for MATLAB*

116. page 515, Lab 2: (text line 1): Manipulating sinusoidal functions using

117. page 515, Lab 3: (text replace last sentence):
Several pieces of sheet music are provided for music synthesis.

118. page 515, Lab 4: (text line 3): These signals which implement...

119. page 516, Lab 5: (text line 2): FIR filters in MATLAB, and ...

120. page 516, Lab 5: (text line 7): linearity and time-invariance are reviewed.

121. page 516, Lab 6: (text line 5): ...can be reordered

122. page 516, Lab 10: (text lines 1 and 4): A MATLAB tool called PeZ (short...via PeZ

123. page 517, Lab 9: Sampling and Zooming of Images *(new title)*

124. page 517, Lab 9: (text line 3): Different interpolation filters are developed and tested...