Errata for *Fundamentals of Semiconductor Devices*

Anderson & Anderson, first edition, 2005.

Page 25, sentence after Equation 1.43, :…we can rearrange Equation 1.40…" (the Equation number is missing)

Page 97, paragraph 2, line 6, should be E_{g0} not $E_g(0)$

Page 97, Figure 2.24: the arrow for E_{g0}should extend between $E_{C0}$and E_v.

Page 105, Problem 2.2 Problem statement should use $\sin^2(Kb)$ instead of Ka to avoid confusion with the lattice constant. The solutions manual should everywhere replace "*a*" with "*b*."

Page 115, top paragraph, line 5, should be dQ instead of $Q=qpAv_{dp}dt$

Page 141, Equation 3.66 has some wrong minus signs. The second equation should read

$$\frac{\partial p}{\partial t} = \frac{\partial \Delta p}{\partial t} = -p\mu_p \frac{\partial(\mathrm{E})}{\partial x} - \mu_p \mathrm{E} \frac{\check{Z}p}{\partial x} + D_p \frac{\partial^2 p}{\partial x^2} + G_{op} - \frac{\Delta p}{\tau_p}$$

Page 146, Figure 3.21: the labels τ_n and τ_p are swapped in the graph. The upper trace should be τ_p, and the lower trace should be τ_n

Page 187 Equation S1A.16: the 3-D case should show a vector sign on the velocity, e.g.

$$v_g = \frac{1}{\hbar}\frac{dE}{dK} \quad \text{one dimension}$$

$$\vec{v}_g = \frac{1}{\hbar}\nabla_K E \quad \text{three dimensions}$$

Page 188, last sentence just before Equation S1A.18 should read "All are with minima at $K=0$ and $E=E_0$. (not E=0)

Page 189, Equation S1A.21: the K should be a vector, e.g. $\left|\vec{K}\right| = \frac{2\pi}{\lambda}$

Page 189, Equation S1A.16 (repeated): the 3-D case should show a vector sign on the velocity, e.g.

$$v_g = \frac{1}{\hbar}\frac{dE}{dK} \quad \text{one dimension}$$

$$\vec{v}_g = \frac{1}{\hbar}\nabla_K E \quad \text{three dimensions}$$

Page 211, Problem S1A.3: there should be a minus sign in the exponent, e.g. $\Psi_2 = A\sin(2\pi x/L)e^{-j(E_2/\hbar)t}$. This error also appears in the problem statement in the solutions manual, but not the solution.

Page 233,, problem S1B.1, Current should be 1 mA, not 10 mA, and Hall voltage should be –3.12 mV, not –3.12 μV.

Page 233, Problem S1B.3a, Insert "Since the lattice constants are nearly equal, we can assume the force between atoms to be comparable." Before "For a material consisting of a single atom type (e.g. silicon), the lattice becomes a diamond lattice and $M_1=M_2$. Explain why the optical phonon energy for diamond (carbon) is greater than that for silicon, which is in turn greater than that for germanium.

Page 241, Figure 5.2: V_{bi} should be qV_{bi}.

Page 292, Equation 5.116: missing a factor of q/kT. It should be

$$C_{sc} = \frac{dQ_{st}}{dV_a} = \delta\frac{dQ_s}{dV_a} = \delta I \tau_n \frac{q}{kT}$$

Page 293, Stored charge capacitance example, second to last line on the page:

$$C_{sc}(-5) = \delta I \tau_n$$

$$= (0.5)(3.4\times10^{-19}A)(3\times10^{-6}s)\left(\frac{1.6\times10^{-19}C}{1.38\times10^{-23}J/K\bullet 300K}\right) = 1.97\times10^{-23}F \approx 0$$

Page 294, continuing example, first equation on page should be

$$C_{sc}(0.75) = \delta I \tau_n \frac{q}{kT} = (0.5)(3.4\times10^{-6}A)(3\times10^{-6}s)\frac{1.6\times10^{-19}C}{1.38\times10^{-23}J/K\bullet 300K} = 63.7pF$$

Page 343, Problem 6.7,
Consider the Type I Np heterojunction of Figures 6.8 and 6.9 in which the net doping ND' and NA' are uniform on the N and p sides respectively. Let ε_n be the permittivity on the N side and ε_p that on the p-side. Solve Poisson's equation to find the depletion widths w_n and w_p on the ~~n~~N and p sides and the total depletion width. This is similar to the procedure used in Chapter 5 for homojunctions. (Hint: At the interface, displacement (εE) is continuous

Page 355, Equation S2.35 should be

$$C_{sc} = \frac{dQ_s}{dV_a} = \delta\frac{dQ_s}{dV_a} = \delta I \tau_n \frac{q}{kT}$$

Page 356, example S2.2 solution, for long base diode result should be

$$C_{sc} = \delta I \tau_n \frac{q}{kT} = \frac{1}{2} \times 10^{-2} \times 2.9 \times 10^{-6} \times \frac{1.6 \times 10^{-19}}{1.38 \times 10^{-23}(300)} = 5.6 \times 10^{-7} F$$

For the short-base diode the result should be

$$C_{sc} = \delta I \tau_n \frac{q}{kT} = \delta I \frac{(W_B)^2}{2D_n} = \frac{2}{3} \times 10^{-2} A \frac{(0.3 \times 10^{-4} cm)^2}{2 \times 20 cm^2 / s} = 1.5 \times 10^{-12} F$$

The following text should say that the stored-charge capacitance for the long-base diode is about 4×10^5 time as large as for the short-base diode.

Page 369 Problem S2.2. At the end of the problem statement, it should say, "The junction size is $10^{-4} \times 10^{-4}$ cm."

Page 369, Problem S2.3, let the junction area be 5×10^{-7} not 5×10^{-8} cm^2.

P 371 probl S2.7, the "N" should not be in italics since it is a SPICE variable,
Page 374, paragraph 2, line 7, should be "Vgs," not "Vds"

P 439 Problem 7.2 a, should read "Draw an energy band diagram similar to Figure 7.5(b)…" (Not Figure 7.2(c)

P 440 Problem 7.5, …"is equal to the hole concentration in the p-type bulk."

p. 440. Problem 7.7, The permittivity of silicon DIOXIDE is…"

p 440, problem 7.12, should have a question mark.

p 440, problem 7.13, "… and its width W," comma or something, not a period.

p 489, problem 8.9, should have "cm^{-3}" after N_A'.

P 498, Figure S3.4: the arrows for the quantity $q\phi_f$ should indicate the difference between E_i and E_f, not E_f and E_V .

p 548, problem S3.3. should refer to figure S3.3., not Figure 8.2

p. 549, problem S3.10, should be "N_D'" not N_A'.

p. 550, problem S3.11, should be cm^{-2} , not just cm.

p. 641, problem 10.13, "…and the leakage current density…" add "density." At the end of the problem add "Assume that the area of the base-collector junction is 10 times that of the Schottkly diode."

Pge ,449, Figure 8.4 (a) is drawn incorrectly. The gate electrodes should be over the gate.

page Equation 1.15: two equations are run together on the same line- the first should be deleted

Equation 1.17: the value of ε_0 is incorrect: it should be 8.85, not 9.85
page 35, after equation (1`.43) it should say ..can rearrange equation (1.40) as follows:

page 197, Equation S1A.46 should not have negative sign in front of j in exponent.

page 213 Problem S1A.12 part b: should be an = sign in $\psi_c(x) = De^{-a(x-L)x}$

page 8, Equation 1.17, next to last line, exponent should be -18, not -17

Page 27, Equaton 1.54 should be $\hbar^2 \frac{1}{m_0}$

Page 19, should say "subshell" in the very last line on the page- or be clearer that the 3rd shell splits into valence and conduction, and that the $3s^2$ and $3p^6$ combine to make the valence band, and the 3d shell makes the conduction band. If that's the case.

page 241, Figure 5.2, should be qV_{bi} not V_{bi}.

page 141 equation 3.66 should be dp/dt = -p(mup)dE/dx - (mup)Edp/dx + Dpd^2/dx^2+Gop-deltaP/taup b/c of the sign in 3.64 and 3.65.