Errata and Comments

for *Linear Circuit Analysis* by Artice Davis, used in E17 at UCD
Last updated on November 6, 2010 by Prof. Spencer

Page	Error or comment
4	In the first line, the book equates an element with a branch. That is certainly a valid definition of branch, however, in common usage, a branch is actually more general and is well described by the IEEE Standard Dictionary of Terms as "A portion of a network consisting of one or more two-terminal elements in series, comprising a section between two adjacent branch points." A "branch point" is, essentially, a node, so when it says "adjacent" branch points it obviously ignores the nodes in-between the elements in the branch itself. If they are all resistors, we can reduce the number of essential nodes (defined in Section 4.2) in a circuit by combining the resistors into one equivalent resistance for the purpose of analyzing the rest of the circuit.
118	In Figure 4.23, the top voltage source should also be a short circuit (the 6V source from Figure 4.22, which is connected between nodes 2 and 3).
136	There is an equal sign missing on the left of the 2nd line of (4.4-13).
143	There is an equal sign missing in (4.5-17) after the first column vector $[v_1\ v_2]^T$.
176	The first word of the last sentence in Example 5.3 should be "In" rather than "Is".
181	The line immediately below (5.2-32) should say "Solving for v …" rather than "Solving for v_t …"
190	The definition given for an opamp (i.e., a VCVS with infinite gain) is typically taken to be the definition of an *ideal* opamp. We can reasonably use a VCVS with finite gain to model opamps as the book does in deriving (5.4-5) and (5.4-6).
249	The last sentence before Example 6.2 is wrong. The main reason for being concerned about waveforms that vary with time is that they convey information, whereas constant waveforms do not (at least not once you know the constant value). Therefore, all waveforms of practical interest in Electrical Engineering are time varying. DC quantities are used, but typically only to transfer power or to establish the "bias point" of some nonlinear device like a transistor.
257	The terms "operator impedance" and "operator admittance" are not common outside of this text (so people who have not used this text may have no idea what you are talking about if you mention them), but as you will soon learn, they lead directly to the complex impedance and admittance that all books present. Although somewhat unusual, the operator notation is extremely useful.

260	The multiplication sign (×) in Equation (6.2-34) should be deleted. *p* is an operator and does not multiply what follows, it operates on it.
260	In footnote 4, it should say $w(t) \geq 0$, not $w(t) \leq 0$ (it is the energy *absorbed* by the element and must be non-negative for a passive element).
267	In the line immediately above (6.3-27), it should refer to $v_1(t)$, not $v_2(t)$.
279	In Figure 6.54(b), it should say $i(t) = \frac{V_0}{\varepsilon} P_\varepsilon(t-a)$, not $i(t) = \frac{1}{\varepsilon} P_\varepsilon(t-a)$.
280	Figure 6.55(a) is wrong. The exponential starts on the open circle at (a, $1/\tau$) and decays to zero (not $1/\tau e$). It goes through the point ($a + \tau$, $1/\tau e$) on the way to zero.
283	In the line just above (6.6-10) the book refers to the "Leibniz rule". Most calculus books don't use this name so you may be confused, but all it refers to is the rule for differentiating a product of functions.
288	Example 6.21 may confuse you if you think about it carefully. The switch shown in Figure 6.77 looks like it is a "break before make" switch, meaning that it would break one connection before making the next. If that were true, then $i(t)$ would have to be zero for an instant (an open circuit cannot have current flow through it). In reality, if you tried to build this circuit with such a switch, you would find that when the current in the inductor tried to decrease to zero in the instant the switch was opened it would produce a very large voltage spike, Ldi/dt, that would breakdown the air between the switch contact points and cause an electric arc (as mentioned in the example). Depending on the amount of energy stored in the inductor, this electric arc might destroy the switch.
316	A few extra words of explanation might make it easier to follow the development on this page. Equation (7.1-12) seems to pop out of nowhere, but it is developed because it will be used in deriving (7.1-13). If you multiply both sides of (7.1-10) by e^{at} and then use (7.1-12) to replace the left side of the modified (7.1-10), you arrive at (7.1-13).
317	In the line immediately following (7.1-23), it should say $p = d/dt$, not $p = p/dt$.
319	The middle curve on Figure 7.7 should say $a = 0,\ \tau = \frac{1}{a} = \infty$, not $\tau = \frac{1}{a} = 0$.
320	To see how to get (7.1-34) first note that $x(t) = v_s(t)/RC = u(t)/RC$. Then look at the middle term in (7.1-26), where $x(t) = u(t)$, and simply replace $u(t)$ by $u(t)/RC$.
328	To get (7.2-8) from (7.2-7), just note that the left side of (7.2-8) is the same as (7.2-5), which is what he started with, and the right side of (7.2-8) is the right side

	of (7.2-7) if you use the first-order solution operator from (7.1-16). Then, in the line immediately following (7.2-8), he refers to long division of the polynomials. Note that if you divide $p + a$ into p, it goes once, and then when you subtract $p + a$ from p, you are left with $-a$. Therefore, the result of the long division is $1 - a/(p + a)$ as stated.
331	Don't be too bothered if the discussion of the scaled units in Figure 7.29 bothers you, we aren't using "scaled units" in this class per se (although you should certainly be comfortable with the fact that a 1mA current flowing through a 1kΩ resistor produces a 1V drop!).
341	Note that Example 7.13 is impractical. While it is very common to build circuits that trap charge on capacitors (as in Example 7.12), I have never seen a circuit that traps flux linkage (i.e., current) on inductors as shown in Example 7.13. It turns out that when real switches are considered, it is possible to trap charge on a capacitor (although some charge will either be added or subtracted by the switching operation). However, when real switches are considered, it is extremely difficult (impossible??) to switch inductors with currents in them as shown, the currents always end up being changed drastically during the switching operation.
372	In Figure 7.99, the left-hand figure is part (a) and the right-hand figure is part (b). Also, in the 4^{th} line down in the paragraph immediately below Fig. 7.100, the text mentions a "purely real" Thevenin resistance. You have not learned about complex impedance yet, so this expression may be confusing to you, but just take it at face value – you only know about purely real Thevenin resistances at this point! And, in fact, if it weren't purely real, it would be a Thevenin impedance, not a resistance.
374	Note that the resistance R_{eq} found in step 4 of the Equivalent Circuit Method is the Thevenin resistance seen by the capacitor or inductor. It is also sometimes called the *driving-point* resistance.
378	The solution given in the 2^{nd} line of the page for the circuit in Fig. 7.115 is wrong, it should be $v(t) = 2 + 3e^{-2t}$ for $t > 0$. Also, it *is* possible to get this solution using (7.7-8) but you have to realize that when the switch is thrown at $t = 0$, the charge shares between the two (1/8)F caps. The charge on the left cap at $t = 0-$ is $q_L(0-) = \frac{8}{8} = 1$C and the charge on the right cap at $t = 0-$ is $q_R(0-) = \frac{2}{8} = \frac{1}{4}$ C. The total charge is the same after the switch is thrown, 5/4 C, but the capacitance is now the sum of the two caps, (1/4)F, so the voltage is $v(0+) = \frac{5/4}{1/4} = 5$ V.
401	In (8.2-10) there is a y_1 that is mistakenly typeset as a subscript.

429	Equation (9.1-31) and the paragraphs immediately before and after it are extremely important! In practice, this is the most important thing in the entire section. You should be sure to work out the details of Examples 9.3 and 9.4 using this fact.
430	The paragraph above Figure 9.8 makes a very important point that I want to stress: All possible system operators for a given circuit will have the exact same denominator polynomial (if you don't cancel any terms with a specific numerator). The reason for this is that the denominator polynomial depends on the basic topology of the deactivated circuit. The numerator polynomials differ, however, because they depend on where you place a source into the deactivated network and which variable you define to be the output.
542	The comment in italics in the paragraph preceding (11.1-8) is extremely important, but it does assume a linear circuit, which is not explicitly stated. With the possible exception of a couple of examples late in the quarter, every circuit we deal with in E17 will be linear, so this comment applies.
542	In (11.1-8) it is common to call θ the "phase" of the waveform as is done here. But, strictly speaking, the phase of the cosine is the entire argument, $(\omega t + \theta)$, and θ is simply a phase offset. Don't allow this minor notational ambiguity to bother you, we will use the terminology used here, which is the standard in engineering (not necessarily in math courses).
555	In the line immediately below (11.2-14), it should say that we call $X(\omega)$ the reactance.
556	When reading about the series-parallel equivalent circuits it is extremely important to bear in mind the comment made in italics just below Example 11.11 on page 557; namely, these circuits are only "equivalent" at a single frequency!
568	In the second sentence below Table 11.4 the author states that "When we are discussing power, we use the term 'load' synonymously with 'subcircuit.'" Whether or not we call a subcircuit a load really has nothing to do with whether we are thinking about power, voltage, current or none of the above (we may, for example, really only be concerned with the information contained in the signal). We call a subcircuit a load when we think of it as being the block driven by some preceding block. So, for example, the speakers are the load for a stereo amplifier, but the amplifier input is the load for the CD player.
584	In the 6th line of the 3rd paragraph on the page, it says "… $P(t) = dw/dt = d/dt\left[v(t)i(t)\right]$ …" but it should be " … $P(t) = dw/dt = \left[v(t)i(t)\right]$ …"
585	In the 2nd sentence after Example 11.22 the "v_1, v_2, … v_N" and the "i_1, i_2, … i_N"

	should be swapped.
1038	In Definition A.4, property 2, it should read (note the second a_i in each line should be a_j instead): $$D(\overline{a}_1,\cdots,c_1\overline{a}_i+c_2\overline{a}_j,\cdots,\overline{a}_n) = c_1D(\overline{a}_1,\cdots,\overline{a}_i,\cdots,\overline{a}_n)+c_2D(\overline{a}_1,\cdots,\overline{a}_j,\cdots,\overline{a}_n)$$
1085	The solution to 5.1-3 should be $v_o(t)=-4\sin(\omega t)$ V.
1086	The solution to 6.3-3 is wrong. The final value of the current should be -2A, not -4A.