A First Course In Laboratory Optics, 1ˢᵗ ed.

ERRATA

Page Description of Error

1 In the last line, "(See Exercise 8.1)" should read "(See Exercise 1.4)"

2 In the line immediately after (1.9) $k = \omega/\nu$ should read $k = \omega/c$.

3 Footnote to the discussion of the i/λ term is is missing. The footnote should read: "This $90°$ phase shift has the same physical origin as the Gouy phase, Eq. (4.10), and the $1/\lambda$ dependence can be understood as a wavelet density."

4 In (1.13), the factor u_0 should be kept inside the rightmost integral for clarity.

9 The third sentence of the second paragraph should read: "In a source with high spatial coherence, the relative phases of all the emitters remain constant, or nearly so." Four sentences later, the first phrase should read "As long as the *relative* phases of all the emitters..."

14 Footnote. The IRC laser classes are: 1, 1M, 2, 2M, 3R, 3B, and 4. (There is no plain class 3.)

15 Under item "**Remember the safety glasses**," the text should read: "Keep safety glasses in a particular place. Always put them on *before* turning on the laser! For keyed lasers, it can be a good reminder to store the key near the glasses."

42 Exercise 2.9 should read: "...where $N > 0$ and k are real constants..."
Exercise 2.10 should read: "...where a_{ref} is a *real* constant..."

46 2ⁿᵈ paragraph, 5ᵗʰ line should start: "by the first *lens* by a distance of $4f$ as before."

53 The right hand side of (3.12) is inverted. The equation sould read $M = b/a$

66 The second equipment item is a lens whose diameter is incorrectly stated. It should be 25 mm, not 250 mm.

76 Line immediately after (4.14) should read: "where $I0 = I(0,0,0)$ for $n = 0$ and $m = 0$, is the TEM$_{00}$ mode irradiance on the optic axis at the beam waist."

79 Sentence immediately after (4.18) should read: "With these substitutions, X, Y, X', and Y' are unitless, and Eq. (4.16) becomes"

80 Immediately after (4.21), the sentence should read: "The initial beam parameter at $z = 0$ is $q_1 = \frac{i\pi w_0^2}{\lambda}$..."

81 In (4.25), m can also be negative so use $m \in \mathbb{Z}$ rather than $m = 0, 1, 2, \ldots$

83 Problem 4.6, the complex beam parameter q is missing units. It's in millimeters: $q = 496.3i$ mm. Also, the second-to-last sentence should read: "Find d and *show that* the beam radius at the new waist is $w_0' = \frac{w_0\epsilon}{\sqrt{(1+\epsilon^2)}}$ where $\epsilon = \frac{f\lambda}{\pi w_0^2}$.

Problem 4.7 should read: "A collimated Gaussian beam with beam radius w_0 is focused to a waist of radius w_0' by a lens of positive focal length f. Use the result for w_0' in Problem 4.6 to show that $w_0' \propto f$ provided $w_0' \ll w_0$.

94-95 Replace E_x with $E_{x-\text{arm}}$ and E_y by $E_{y-\text{arm}}$ to eliminate confusion with vector components of the electric field.

95 Second paragraph, line 4 should read: "...in order to *to compensate for external perturbations and* keep..."

101 Second-to-last sentence before (5.28): "...accessible wavelengths." should be replaced by "...accessible frequencies."

106 Last sentence of problem 5.1 should read: "Estimate the magnitude of the angular misalignment in degrees, if the wavelength is 623.8 nm."

107 Problem 5.6, 5th line: "…. . .. Calculate the *angular* speed. . ."

Problem 5.6, last line. Add the sentence: "Assume a wavelength, $\lambda = 632.8$ nm and arm length, $L = 1$ m."

138 Sentence immediately after (7.18). The formala for finesse should read $\mathcal{F} = 4\pi/T_i$.

142 First sentence of section 7.3.2 should read: "The TEM_{mn} *resonant* modes..."
Second sentence of section 7.3.2 should read: "So far, *in Section 4.1.1*, we've only discussed the spatial shape. . ."

144 Problem 7.1. Replace $r_1 \to 0$ with $r_1 \to r_i$ in two places.

Problem 7.4. Delete the second half of the problem, starting with the sentence "Incorporate optical lossess. . .". Replace the deleted part with: "Show that $t_{\text{crit}} = \rho/\sqrt{1 + \rho^2}$ where $\rho \equiv \sqrt{t_e^2 + \beta}$ and β is the fractional power lost per round trip in the cavity due to all sources other than transmission through the caivty mirrors. *Hint*: Replace t_e^2 with $t_e^2 + \beta$ in (7.10)."

Problem 7.5, first line: $\frac{\lambda}{2L}$ should read $\frac{c}{2L}$.

Problem 7.9, last line. Delete: "and $\beta = 1$ ppm". Add "*Hint*: For the first part, use the result of Problem 7.4. For the second part, refer to Example 7.2."

Problem 7.11, diagram. The diameter of the beam waist should be $2\omega_0$, not 2ω.

Problem 7.11. Delete the two lines following the diagram.

145 Problem 7.7 should read: "If a lossless cavity has a perfectly reflecting endmirror, $t_e = 0$, and very slightly transmitting input mirror, $0 < t_i \ll 1$, show that the quality factor is $Q = 2\pi \frac{E}{\Delta E}$, . *Hint*: First show that $\Delta E = P_l \lambda_n/c$, where P_l is the power in the leakage field. Then use the result of Exercise 7.6

155 Last paragraph before Example 8.1 should read:
"The corresponding ratios of the reflected or transmitted *power* to the incident *power* are indicated by capital letters, such as

$$R_p = \frac{\text{Reflected power in } p\text{-polarization}}{\text{Incident power in } p\text{-polarization}}.$$

The reflected beam travels in the same medium as the incident beam, so the index is the same. Reflection also doesn't change the beam's cross-sectional area. So $R = r^2$, independent of polarization. The case of the transmitted beam is more complicated because the cross-sectional area of the transmitted beam is different from that of the incident beam due to foreshortening when the angle of travel changes at the interface. The beam is also traveling at a different speed in the transmitted medium than in the incident medium. The combination of these two effects implies that regardless of polarization

$$T = \frac{n_t \cos\theta_t}{n_i \cos\theta_i} t^2.$$

161 In (8.37) both factors of $\frac{1}{\sqrt{2}}$ should instead be $\frac{1}{2}$, and the corresponding factor of $\frac{1}{2}$ in (8.38) should be $\frac{1}{4}$.

162 Problem 8.1. In the denominators of both equations, replace "irradiance" with "power".

165 Caption to Figure 8.3 should also state: "θ is the angle of incidence".

198 Problem A.8, second line. Replace "product" with "square".

Problem A.9. The sentence starting in the third line should read: "If you're using Matlab, Python, or similar, you may not use any pre-built functions specifically for generating prime numbers.

199 Last sentence of Exercise A.10 should read: "How long is the longest such sequence for $d \leq 1000$?"