**A First Course In Laboratory Optics, $1^{\text{st}}$ 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 $i/\lambda$ 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** Sentence immediately before (1.12) should read "…in terms of $\frac{y'}{L}$, assuming $(x - x') \ll L$, as".

**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 $a_{\text{ref}}$ is a *real* constant…"

**46** $2^{\text{nd}}$ paragraph, $5^{\text{th}}$ 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 $\text{TEM}_{00}$ 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 $q_1 = \frac{i\pi w_0^2}{\lambda}\ldots$

**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 $w_0' \ll w_0$.

Problem 4.9 should read: "(Computer problem) In the $yz$-plane, plot...

**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, 5$^{\text{th}}$ 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** Line immediately after (7.16) should read "where $\lambda$ is the laser wavelength and..."

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 $\beta$ is the fractional power lost per round trip in the cavity due to all sources other than transmission through the caivty mirors. *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 $2\omega$.

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 $Q = 2\pi\frac{E}{\cdot}\Delta E$, . *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: "$\theta$ 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 $d \leq 1000$?"