

Bibliography

- Baumeister, P. W., *Optical Coating Technology*, SPIE Press, Bellingham, Washington (2004) [doi: 10.1117/3.548071].
- Born, M., and E. Wolf, *Principles of Optics: Electromagnetic Theory of Propagation, Interference and Diffraction of Light*, 7th (expanded) Edition, Cambridge University Press, Cambridge (1999).
- Farrel, J., *Object-Oriented Programming using C++*, Cengage Learning, 4th Edition, Independence, Kentucky (2008).
- Fowles, D. R., *Introduction to Modern Optics*, 2nd Edition, Dover Publications, Inc., Mineola, New York (1989).
- Gelber, R. M., "A Method of Design for an Absorbing Thin Film Multilayer," Doctoral thesis, University of Rochester, Rochester, New York (1968).
- Gerrard, A., and J. M. Burch, *Introduction to Matrix Methods in Optics*, Dover Publications, Inc. Mineola, New York (1994).
- Gonzales, R. C., and R. E. Woods, *Digital Image Processing*, 2nd Edition, Prentice-Hall, Upper Saddle River, New Jersey (2002).
- Greivenkamp, J. E., *Field Guide to Geometrical Optics*, SPIE Press, Bellingham, Washington (2004) [doi: 10.1117/3/547461].
- Hanselman, D., and B. Littlefield, *Mastering MATLAB 7*, Prentice-Hall, Upper Saddle River, New Jersey (2011).
- Hardy, J. W., *Adaptive Optics for Astronomical Telescopes*, Oxford University Press, Oxford (1998).
- Heavens, O. S., *Optical Properties of Thin Solid Films*, Butterworths Scientific Publication, London (1955).
- Hecht, E., *Optics*, 4th Edition, Addison-Wesley, San Francisco (2001).
- James, J., *Spectrograph Design Fundamentals*, Cambridge University Press, Cambridge (2007).
- Jones, B. L., and P. Aitken, *Teach Yourself C in 21 days*, 5th Edition, Sams Publishing, Indianapolis, Indiana (2002).
- Macleod, H. A., *Thin-Film Optical Filters*, 3rd Edition, CRC Press, Boca Raton, Florida (2001).
- Malacara, D., *Optical Shop Testing*, Third Edition, John Wiley & Sons, Hoboken, New Jersey (2007).

- MathWorks www.mathworks.com.
- Moore, H., *MATLAB® for Engineers*, 4th Edition, Prentice-Hall, Upper Saddle River, New Jersey (2014).
- Palmer, C., *Diffraction Grating Handbook*, 7th Edition, Richardson Gratings™, A Newport Corp. Brand, New York (2014).
- Pratap, R., *Getting Started with MATLAB 7: A Quick Introduction for Scientists and Engineers*, Oxford University Press, Oxford (2006).
- Restaino, S. R., and S. W. Teare, *Introduction to Liquid Crystals for Optical Design and Engineering*, SPIE Press, Bellingham, Washington (2015) [doi: 10.1117/3.2197153].
- Roddier, F., *Adaptive Optics in Astronomy*, Cambridge University Press, Cambridge (2004).
- Rorres, C., and H. Anton, *Applications of Linear Algebra*, John Wiley & Sons, Hoboken, New Jersey (1984).
- Smith, W. J., *Modern Optical Engineering*, 4th Edition, McGraw-Hill Education, New York (2007).
- Strong, J., *Procedures in Experimental Physics*, Prentice-Hall, New York (1938).
- Taylor, J. R., *An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements*, 2nd Edition, University Science Books, Sausalito, California (1996).
- Teare, S. W., and S. R. Restaino, *Introduction to Image Stabilization*, SPIE Press, Bellingham, Washington (2006) [doi: 10.1117/3/685011].
- Teare, S. W., S. R. Restaino, and D. M. Payne, “Fast steering, high-resolution imaging system,” *Optics Express* **10**(1), 65–69 (2002).
- Thompson, L. A., S. W. Teare, Y.-H. Xiong, R. M. Castle, A. Chakraborty, R. A. Gruendl, and R. W. Leach, “UnISIS: Laser guide star and natural guide star adaptive optics system,” *Publications of the Astronomical Society of the Pacific* **121**(879), 498–511 (2009).
- Tyson, R., *Principles of Adaptive Optics*, 3rd Edition, CRC Press, Boca Raton, Florida (2010).
- Willey, R. R., *Field Guide to Optical Thin Films*, SPIE Press, Bellingham, Washington (2006) [doi: 10.1117/3/668269].

Index

A

Abbe number, 97
absorption, 192
App Designer, 213
ASCII values, 54
`atan2()`, 149
`axis()`, 26

B

blazed grating, 103
built-in interfaces, 207

C

calcite crystal, 153
`calcRmn()`, 146
`calcZP()`, 146
Carpenter prism, 104
case sensitive, 9
Cauchy dispersion
 equation, 92
`ceil()`, 26
chromatic aberrations, 143
coherent waves, 127
color models, 70
`colormap()`, 69, 71
Command Window, 5
complex index of
 refraction, 189
`contour()`, 32
`conv2()`, 75–76
`csvwrite()`, 57
Current Folder, 5

D

data files, 51
`dialog()`, 210
diffraction gratings, 100
diffraction, 130
`disp()`, 22
`dlmwrite()`, 57
documentation, 221
double-slit experiment, 132

E

`edit1_Callback()`, 217
`edit2_Callback()`, 217
Editor, 4
electromagnetic wave, 126

F

Fabry–Pérot, 179
Fastie–Ebert, 107
`fclose()`, 57
`fftshift()`, 122
`floor()`, 26, 74
`fopen()`, 57
`for()`, 22–24, 30, 69, 175
format statement, 22
FORTRAN, 223
Fourier transform, 116
`fprintf()`, 22, 24, 57, 164, 217
full-width-at-half-maximum, 49

G

`gca()`, 214

- `getTM.m()`, 200
 graphical user interface, 205
 graphics files, 64
 grism, 104
 GUIDE, 210
- H**
`histogram()`, 12, 27–28
- I**
`if()`, 26
 image files, 60
`image()`, 66
`imagesc()`, 35, 66, 69
`imread()`, 64–65
`imwrite()`, 65
 index of refraction, 91
`Inf`, 23
 input dialog box, 210
 interactive programs, 206
- J**
 JAVA, 227
 Jones calculus, 159
 Jones matrix, 161
 Jones vector, 160
- K**
`kron()`, 168
- L**
 Laplacian, 77
 large telescope mirrors, 185
 Lensmaker's equation, 81
`linspace()`, 24
`load()`, 59
- M**
 m-file, 6
 Mach–Zehnder interferometer, 136
 MAT file, 59
 MATLAB IDE, 4
 MATLAB script, 7
- MATLAB® built-in functions**, 9
`max()`, 26, 71
`mean()`, 12, 45
`mesh()`, 32
`meshgrid()`, 31
 message box, 207
 metal coatings, 185
 metal deposition, 188
 mexFunction programming, 226
`mexFunction()`, 224
 Michelson stellar interferometer, 133
`min()`, 26
 modulation transfer function, 108
 monochrometer, 106
`msgbox()`, 217
 Mueller calculus, 165
`myadder()`, 225–226
`myplot()`, 25–26
`mysave()`, 56–57
- N**
`NaN`, 23, 152
 noise, 46
- O**
 object-oriented programming, 227
 operators, 9
 optical aberrations, 143
- P**
 P-code, 220
 phase retarders, 162
 plane-polarized electric field, 156
`plot()`, 14, 24–25, 32, 41
`plot3()`, 32
 point spread function, 114
 polarization, 153
`polyfit()`, 39, 41–42, 47, 92
 polynomial functions, 36
`polyval()`, 39, 41, 92
 potential transmittance, 194
 prisms, 98
`publish()`, 221

- publishing, 222
`pushbutton1_Callback()`, 217
- Q**
`quiver()`, 32
- R**
`randn()`, 27–28, 41, 47, 49
raster graphics, 64
ray tracing, 85
ray-transfer matrix, 81
`rng()`, 48
- S**
`save()`, 55–57, 59
saving, 58
Shack–Hartmann sensor, 138
signal-to-noise ratio, 44
single-slit diffraction, 20
`size()`, 25, 57, 74
smoothing filter, 30
Snell’s law, 96
spatial filtering, 72
spectrometer, 106
`sprintf()`, 22
standard deviation, 49
statistics, 41
`std()`, 12, 27, 45, 49
super-pixel, 67
`surf()`, 32
- `surfl()`, 32
`switch()-case()`, 175
- T**
thin film interference filters, 170
thin prism, 96
transfer matrix, 170
transpose operator, 12
- U**
`uigetfile()`, 208
Unsharp Mask, 77
USAF bar chart, 115
- V**
vacuum thermal deposition, 188
vectorization, 12
version control, 223
visibility, 110
visualization project, 215
visualization tools, 34
- W**
wave plates, 162
`while()`, 57
Workspace, 4
- Z**
Zernike polynomials, 138, 144



Scott W. Teare received a Ph.D. in Physics from the University of Guelph, Canada and is currently professor of Electrical Engineering and Research Scientist at the Energetic Materials Research and Testing Center at New Mexico Institute of Mining and Technology in Socorro, New Mexico. He regularly teaches university courses in optics, electronics, and MATLAB®. His primary research interests include adaptive optics and wavefront sensing; thin film optical filters; electrical and optical properties of energetic materials; and ballistics. He has authored or coauthored more than 100 technical papers and 3 SPIE *Tutorial Texts*, and has been awarded 4 patents. He volunteers with ABET and has served on the Engineering Accreditation Commission as an Evaluator and Commissioner, and is currently on the Board of Delegates. He is a member of the Canadian Association of Physicists and the Royal Astronomical Society, and is a Senior Member of IEEE and a Fellow of SPIE.