

Bibliography

- [1] J. A. Kong, *Theory of electromagnetic waves*. New York, Wiley-Interscience, 1975.
- [2] A. Einstein *et al.*, “On the electrodynamics of moving bodies,” *Annalen der Physik*, vol. 17, no. 891, p. 50, 1905.
- [3] P. A. M. Dirac, “The quantum theory of the emission and absorption of radiation,” *Proceedings of the Royal Society of London. Series A, Containing Papers of a Mathematical and Physical Character*, vol. 114, no. 767, pp. 243–265, 1927.
- [4] R. J. Glauber, “Coherent and incoherent states of the radiation field,” *Physical Review*, vol. 131, no. 6, p. 2766, 1963.
- [5] C.-N. Yang and R. L. Mills, “Conservation of isotopic spin and isotopic gauge invariance,” *Physical review*, vol. 96, no. 1, p. 191, 1954.
- [6] G. t’Hooft, *50 years of Yang-Mills theory*. World Scientific, 2005.
- [7] C. W. Misner, K. S. Thorne, and J. A. Wheeler, *Gravitation*. Princeton University Press, 2017.
- [8] F. Teixeira and W. C. Chew, “Differential forms, metrics, and the reflectionless absorption of electromagnetic waves,” *Journal of Electromagnetic Waves and Applications*, vol. 13, no. 5, pp. 665–686, 1999.
- [9] W. C. Chew, E. Michielssen, J.-M. Jin, and J. Song, *Fast and efficient algorithms in computational electromagnetics*. Artech House, Inc., 2001.
- [10] A. Volta, “On the electricity excited by the mere contact of conducting substances of different kinds. in a letter from Mr. Alexander Volta, FRS Professor of Natural Philosophy in the University of Pavia, to the Rt. Hon. Sir Joseph Banks, Bart. KBPR S,” *Philosophical transactions of the Royal Society of London*, no. 90, pp. 403–431, 1800.
- [11] A.-M. Ampère, *Exposé méthodique des phénomènes électro-dynamiques, et des lois de ces phénomènes*. Bachelier, 1823.
- [12] ——, *Mémoire sur la théorie mathématique des phénomènes électro-dynamiques uniquement déduite de l’expérience: dans lequel se trouvent réunis les Mémoires que M. Ampère a communiqués à l’Académie royale des Sciences, dans les séances des 4 et*

- 26 décembre 1820, 10 juin 1822, 22 décembre 1823, 12 septembre et 21 novembre 1825.*
Bachelier, 1825.
- [13] B. Jones and M. Faraday, *The life and letters of Faraday*. Cambridge University Press, 2010, vol. 2.
 - [14] G. Kirchhoff, “Ueber die auflösung der gleichungen, auf welche man bei der untersuchung der linearen vertheilung galvanischer ströme geführt wird,” *Annalen der Physik*, vol. 148, no. 12, pp. 497–508, 1847.
 - [15] L. Weinberg, “Kirchhoff’s third and fourth laws’,” *IRE Transactions on Circuit Theory*, vol. 5, no. 1, pp. 8–30, 1958.
 - [16] T. Standage, *The Victorian Internet: The remarkable story of the telegraph and the nineteenth century’s online pioneers*. Phoenix, 1998.
 - [17] J. C. Maxwell, “A dynamical theory of the electromagnetic field,” *Philosophical transactions of the Royal Society of London*, no. 155, pp. 459–512, 1865.
 - [18] H. Hertz, “On the finite velocity of propagation of electromagnetic actions,” *Electric Waves*, vol. 110, 1888.
 - [19] M. Romer and I. B. Cohen, “Roemer and the first determination of the velocity of light (1676),” *Isis*, vol. 31, no. 2, pp. 327–379, 1940.
 - [20] A. Arons and M. Peppard, “Einstein’s proposal of the photon concept—a translation of the Annalen der Physik paper of 1905,” *American Journal of Physics*, vol. 33, no. 5, pp. 367–374, 1965.
 - [21] A. Pais, “Einstein and the quantum theory,” *Reviews of Modern Physics*, vol. 51, no. 4, p. 863, 1979.
 - [22] M. Planck, “On the law of distribution of energy in the normal spectrum,” *Annalen der physik*, vol. 4, no. 553, p. 1, 1901.
 - [23] A. Houck, D. Schuster, J. Gambetta, J. Schreier, B. Johnson, J. Chow, L. Frunzio, J. Majer, M. Devoret, S. Girvin *et al.*, “Generating single microwave photons in a circuit,” *Nature*, vol. 449, no. 7160, pp. 328–331, 2007.
 - [24] Z. Peng, S. De Graaf, J. Tsai, and O. Astafiev, “Tunable on-demand single-photon source in the microwave range,” *Nature communications*, vol. 7, p. 12588, 2016.
 - [25] B. D. Gates, Q. Xu, M. Stewart, D. Ryan, C. G. Willson, and G. M. Whitesides, “New approaches to nanofabrication: molding, printing, and other techniques,” *Chemical reviews*, vol. 105, no. 4, pp. 1171–1196, 2005.
 - [26] D. J. Griffiths and D. F. Schroeter, *Introduction to quantum mechanics*. Cambridge University Press, 2018.

- [27] J. S. Bell, "The debate on the significance of his contributions to the foundations of quantum mechanics, Bell's Theorem and the Foundations of Modern Physics (A. van der Merwe, F. Selleri, and G. Tarozzi, eds.)," 1992.
- [28] C. Pickover, *Archimedes to Hawking: Laws of science and the great minds behind them*. Oxford University Press, 2008.
- [29] R. Resnick, J. Walker, and D. Halliday, *Fundamentals of physics*. John Wiley, 1988.
- [30] J. L. De Lagrange, "Recherches d'arithmétique," *Nouveaux Mémoires de l'Académie de Berlin*, 1773.
- [31] S. Ramo, J. R. Whinnery, and T. Duzer van, *Fields and waves in communication electronics, Third Edition*. John Wiley & Sons, Inc., 1995, also 1965, 1984.
- [32] J. A. Kong, *Electromagnetic Wave Theory*. EMW Publishing, 2008, also 1985.
- [33] H. M. Schey, *Div, grad, curl, and all that: an informal text on vector calculus*. WW Norton New York, 2005.
- [34] R. P. Feynman, R. B. Leighton, and M. Sands, *The Feynman lectures on physics, Vols. I, II, & III: The new millennium edition*. Basic books, 2011, also 1963, 2006, vol. 1,2,3.
- [35] W. C. Chew, *Waves and fields in inhomogeneous media*. IEEE Press, 1995, also 1990.
- [36] V. J. Katz, "The history of Stokes' theorem," *Mathematics Magazine*, vol. 52, no. 3, pp. 146–156, 1979.
- [37] J. C. Maxwell, *A Treatise on Electricity and magnetism*. Dover New York, 1954, first published in 1873, vol. 1 and 2.
- [38] A. D. Yaghjian, "Reflections on Maxwell's treatise," *Progress In Electromagnetics Research*, vol. 149, pp. 217–249, 2014.
- [39] P. J. Nahin, *Oliver Heaviside: sage in solitude*. IEEE Press New York, 1987.
- [40] J. C. Maxwell, "Poems of James Clerk Maxwell," <https://mypoeticside.com/poets/james-clerk-maxwell-poems>.
- [41] W. K. Panofsky and M. Phillips, *Classical electricity and magnetism*. Courier Corporation, 2005.
- [42] T. Lancaster and S. J. Blundell, *Quantum field theory for the gifted amateur*. OUP Oxford, 2014.
- [43] J. D. Jackson, *Classical Electrodynamics*. John Wiley & Sons, 1962.
- [44] W. C. Chew, "Fields and waves: Lecture notes for ECE 350 at UIUC," <https://engineering.purdue.edu/wcchew/ece350.html>, 1990.

- [45] C. M. Bender and S. A. Orszag, *Advanced mathematical methods for scientists and engineers I: Asymptotic methods and perturbation theory*. Springer Science & Business Media, 2013.
- [46] J. M. Crowley, *Fundamentals of applied electrostatics*. Krieger Publishing Company, 1986.
- [47] C. Balanis, *Advanced Engineering Electromagnetics*. Hoboken, NJ, USA: Wiley, 2012.
- [48] J. D. Jackson, *Classical electrodynamics*. John Wiley & Sons, 1999.
- [49] R. Courant and D. Hilbert, *Methods of Mathematical Physics, Volumes 1 and 2*. Interscience Publ., 1962.
- [50] R. F. Harrington, *Time-harmonic electromagnetic fields*. McGraw-Hill, 1961.
- [51] L. Esaki and R. Tsu, “Superlattice and negative differential conductivity in semiconductors,” *IBM Journal of Research and Development*, vol. 14, no. 1, pp. 61–65, 1970.
- [52] E. Kudeki and D. C. Munson, *Analog Signals and Systems*. Upper Saddle River, NJ, USA: Pearson Prentice Hall, 2009.
- [53] A. V. Oppenheim and R. W. Schafer, *Discrete-time signal processing*. Pearson Education, 2014.
- [54] E. C. Jordan and K. G. Balmain, *Electromagnetic waves and radiating systems*. Prentice-Hall, 1968.
- [55] G. Agarwal, D. Pattanayak, and E. Wolf, “Electromagnetic fields in spatially dispersive media,” *Physical Review B*, vol. 10, no. 4, p. 1447, 1974.
- [56] S. L. Chuang, *Physics of photonic devices*. John Wiley & Sons, 2012, vol. 80.
- [57] B. E. Saleh and M. C. Teich, *Fundamentals of photonics*. John Wiley & Sons, 2019.
- [58] M. Born and E. Wolf, *Principles of optics: electromagnetic theory of propagation, interference and diffraction of light*. Elsevier, 2013, also 1959 to 1986.
- [59] R. W. Boyd, *Nonlinear optics*. Elsevier, 2003.
- [60] Y.-R. Shen, *The principles of nonlinear optics*. New York, Wiley-Interscience, 1984.
- [61] N. Bloembergen, *Nonlinear optics*. World Scientific, 1996.
- [62] P. C. Krause, O. Wasyczuk, and S. D. Sudhoff, *Analysis of electric machinery*. McGraw-Hill New York, 1986.
- [63] A. E. Fitzgerald, C. Kingsley, S. D. Umans, and B. James, *Electric machinery*. McGraw-Hill New York, 2003, vol. 5.
- [64] M. A. Brown and R. C. Semelka, *MRI.: Basic Principles and Applications*. John Wiley & Sons, 2011.

- [65] C. A. Balanis, *Advanced engineering electromagnetics*. John Wiley & Sons, 1999, also 1989.
- [66] Wikipedia, “Lorentz force,” https://en.wikipedia.org/wiki/Lorentz_force/, accessed: 2019-09-06.
- [67] R. O. Dendy, *Plasma physics: an introductory course*. Cambridge University Press, 1995.
- [68] Wikipedia, “Kennelly-Heaviside Layer,” https://en.wikipedia.org/wiki/Kennelly-Heaviside_layer.
- [69] ———, “Spectral line shape,” https://en.wikipedia.org/wiki/Spectral_line_shape.
- [70] P. Sen and W. C. Chew, “The frequency dependent dielectric and conductivity response of sedimentary rocks,” *Journal of microwave power*, vol. 18, no. 1, pp. 95–105, 1983.
- [71] D. A. Miller, *Quantum Mechanics for Scientists and Engineers*. Cambridge, UK: Cambridge University Press, 2008.
- [72] W. C. Chew, “Quantum mechanics made simple: Lecture notes for ECE 487 at UIUC,” <http://wcchew.ece.illinois.edu/chew/course/QMAll20161206.pdf>, 2016.
- [73] B. G. Streetman and S. Banerjee, *Solid state electronic devices*. Prentice hall Englewood Cliffs, NJ, 1995.
- [74] Smithsonian, “This 1600-year-old goblet shows that the romans were nanotechnology pioneers,” <https://www.smithsonianmag.com/history/this-1600-year-old-goblet-shows-that-the-romans-were-nanotechnology-pioneers-787224/>, accessed: 2019-09-06.
- [75] K. G. Budden, *Radio waves in the ionosphere*. Cambridge University Press, 2009.
- [76] R. Fitzpatrick, *Plasma physics: an introduction*. CRC Press, 2014.
- [77] G. Strang, *Introduction to linear algebra*. Wellesley-Cambridge Press Wellesley, MA, 1993, vol. 3.
- [78] K. C. Yeh and C.-H. Liu, “Radio wave scintillations in the ionosphere,” *Proceedings of the IEEE*, vol. 70, no. 4, pp. 324–360, 1982.
- [79] J. Kraus, *Electromagnetics*. McGraw-Hill, 1984, also 1953, 1973, 1981.
- [80] Wikipedia, “Circular polarization,” https://en.wikipedia.org/wiki/Circular_polarization.
- [81] Q. Zhan, “Cylindrical vector beams: from mathematical concepts to applications,” *Advances in Optics and Photonics*, vol. 1, no. 1, pp. 1–57, 2009.
- [82] H. Haus, *Electromagnetic Noise and Quantum Optical Measurements*, ser. Advanced Texts in Physics. Springer Berlin Heidelberg, 2000.

- [83] W. C. Chew, “Lectures on theory of microwave and optical waveguides, for ECE 531 at UIUC,” <https://engineering.purdue.edu/wcchew/course/tgwAll20160215.pdf>, 2016.
- [84] L. Brillouin, *Wave propagation and group velocity*. Academic Press, 1960.
- [85] R. Plonsey and R. E. Collin, *Principles and applications of electromagnetic fields*. McGraw-Hill, 1961.
- [86] M. N. Sadiku, *Elements of electromagnetics*. Oxford University Press, 2014.
- [87] A. Wadhwa, A. L. Dal, and N. Malhotra, “Transmission media,” <https://www.slideshare.net/abhishekawadhwa786/transmission-media-9416228>.
- [88] P. H. Smith, “Transmission line calculator,” *Electronics*, vol. 12, no. 1, pp. 29–31, 1939.
- [89] F. B. Hildebrand, *Advanced calculus for applications*. Prentice-Hall, 1962.
- [90] J. Schutt-Aine, “Experiment02-coaxial transmission line measurement using slotted line,” <http://emlab.uiuc.edu/ece451/ECE451Lab02.pdf>.
- [91] D. M. Pozar, E. J. K. Knapp, and J. B. Mead, “ECE 584 microwave engineering laboratory notebook,” http://www.eecs.umass.edu/ece/ece584/ECE584_lab_manual.pdf, 2004.
- [92] R. E. Collin, *Field theory of guided waves*. McGraw-Hill, 1960.
- [93] Q. S. Liu, S. Sun, and W. C. Chew, “A potential-based integral equation method for low-frequency electromagnetic problems,” *IEEE Transactions on Antennas and Propagation*, vol. 66, no. 3, pp. 1413–1426, 2018.
- [94] Wikipedia, “Snell’s law,” https://en.wikipedia.org/wiki/Snell's_law.
- [95] G. Tylor, *Radiation and propagation of electromagnetic waves*. Academic Press, 1969.
- [96] L. Brekhovskikh, *Waves in layered media*. Academic Press, 1980.
- [97] Scholarpedia, “Goos-hanchen effect,” http://www.scholarpedia.org/article/Goos-Hanchen_effect.
- [98] K. Kao and G. A. Hockham, “Dielectric-fibre surface waveguides for optical frequencies,” in *Proceedings of the Institution of Electrical Engineers*, vol. 113, no. 7. IET, 1966, pp. 1151–1158.
- [99] E. Glytsis, “Slab waveguide fundamentals,” http://users.ntua.gr/eglytsis/IO/Slab_Waveguides_p.pdf, 2018.
- [100] Wikipedia, “Optical fiber,” https://en.wikipedia.org/wiki/Optical_fiber.
- [101] Atlantic Cable, “1869 indo-european cable,” <https://atlantic-cable.com/Cables/1869IndoEur/index.htm>.
- [102] Wikipedia, “Submarine communications cable,” https://en.wikipedia.org/wiki/Submarine_communications_cable.

- [103] D. Brewster, “On the laws which regulate the polarisation of light by reflexion from transparent bodies,” *Philosophical Transactions of the Royal Society of London*, vol. 105, pp. 125–159, 1815.
- [104] Wikipedia, “Brewster’s angle,” https://en.wikipedia.org/wiki/Brewster's_angle.
- [105] H. Raether, “Surface plasmons on smooth surfaces,” in *Surface plasmons on smooth and rough surfaces and on gratings*. Springer, 1988, pp. 4–39.
- [106] E. Kretschmann and H. Raether, “Radiative decay of non radiative surface plasmons excited by light,” *Zeitschrift für Naturforschung A*, vol. 23, no. 12, pp. 2135–2136, 1968.
- [107] Wikipedia, “Homomorphic Encryption,” https://en.wikipedia.org/wiki/Homomorphic_encryption.
- [108] ——, “Surface plasmon,” https://en.wikipedia.org/wiki/Surface_plasmon.
- [109] A. Sommerfeld, *Über die Ausbreitung der Wellen in der drahtlosen Telegraphie*. Verlag der Königlich Bayerischen Akademie der Wissenschaften, 1909.
- [110] W. Chew, *Waves and Fields in Inhomogeneous Media*, 378±381. Van Nostrand, 1990.
- [111] Wikimedia, “Gaussian wave packet,” https://commons.wikimedia.org/wiki/File:Gaussian_wave_packet.svg.
- [112] Wikipedia, “Charles K. Kao,” https://en.wikipedia.org/wiki/Charles_K._Kao.
- [113] H. B. Callen and T. A. Welton, “Irreversibility and generalized noise,” *Physical Review*, vol. 83, no. 1, p. 34, 1951.
- [114] R. Kubo, “The fluctuation-dissipation theorem,” *Reports on progress in physics*, vol. 29, no. 1, p. 255, 1966.
- [115] C. Lee, S. Lee, and S. Chuang, “Plot of modal field distribution in rectangular and circular waveguides,” *IEEE transactions on microwave theory and techniques*, vol. 33, no. 3, pp. 271–274, 1985.
- [116] W. C. Chew, *Waves and Fields in Inhomogeneous Media*. IEEE Press, 1996.
- [117] M. Abramowitz and I. A. Stegun, *Handbook of mathematical functions: with formulas, graphs, and mathematical tables*. Courier Corporation, 1965, vol. 55.
- [118] ——, “Handbook of mathematical functions: with formulas, graphs, and mathematical tables,” <http://people.math.sfu.ca/~cbm/aands/index.htm>.
- [119] W. C. Chew, W. Sha, and Q. I. Dai, “Green’s dyadic, spectral function, local density of states, and fluctuation dissipation theorem,” *arXiv preprint arXiv:1505.01586*, 2015.
- [120] Wikipedia, “Very Large Array,” https://en.wikipedia.org/wiki/Very_Large_Array.
- [121] C. A. Balanis and E. Holzman, “Circular waveguides,” *Encyclopedia of RF and Microwave Engineering*, 2005.

- [122] M. Al-Hakkak and Y. Lo, "Circular waveguides with anisotropic walls," *Electronics Letters*, vol. 6, no. 24, pp. 786–789, 1970.
- [123] Wikipedia, "Horn Antenna," https://en.wikipedia.org/wiki/Horn_antenna.
- [124] P. Silvester and P. Benedek, "Microstrip discontinuity capacitances for right-angle bends, t junctions, and crossings," *IEEE Transactions on Microwave Theory and Techniques*, vol. 21, no. 5, pp. 341–346, 1973.
- [125] R. Garg and I. Bahl, "Microstrip discontinuities," *International Journal of Electronics Theoretical and Experimental*, vol. 45, no. 1, pp. 81–87, 1978.
- [126] P. Smith and E. Turner, "A bistable fabry-perot resonator," *Applied Physics Letters*, vol. 30, no. 6, pp. 280–281, 1977.
- [127] A. Yariv, *Optical electronics*. Saunders College Publ., 1991.
- [128] Wikipedia, "Klystron," <https://en.wikipedia.org/wiki/Klystron>.
- [129] ——, "Magnetron," https://en.wikipedia.org/wiki/Cavity_magnetron.
- [130] ——, "Absorption Wavemeter," https://en.wikipedia.org/wiki/Absorption_wavemeter.
- [131] W. C. Chew, M. S. Tong, and B. Hu, "Integral equation methods for electromagnetic and elastic waves," *Synthesis Lectures on Computational Electromagnetics*, vol. 3, no. 1, pp. 1–241, 2008.
- [132] A. R. Choudhuri, *The physics of fluids and plasmas: an introduction for astrophysicists*. Cambridge University Press, 1998.
- [133] I. S. Gradshteyn and I. M. Ryzhik, *Table of integrals, series, and products*. Academic press, 2014.
- [134] L. Nagel and D. Pederson, "Simulation program with integrated circuit emphasis," in *Midwest Symposium on Circuit Theory*, 1973.
- [135] T. M. Philip and M. J. Gilbert, "High-performance nanoscale topological inductor," in *2017 75th Annual Device Research Conference (DRC)*. IEEE, 2017, pp. 1–2.
- [136] Wikipedia, "Guglielmo Marconi," https://en.wikipedia.org/wiki/Guglielmo_Marconi.
- [137] S. A. Schelkunoff and H. T. Friis, *Antennas: theory and practice*. Wiley New York, 1952, vol. 639.
- [138] H. G. Schantz, "A brief history of UWB antennas," *IEEE Aerospace and Electronic Systems Magazine*, vol. 19, no. 4, pp. 22–26, 2004.
- [139] E. Kudeki, "Fields and Waves," <http://remote2.ece.illinois.edu/~erhan/FieldsWaves/ECE350lectures.html>.
- [140] Wikipedia, "Antenna Aperture," https://en.wikipedia.org/wiki/Antenna_aperture.

- [141] L. Josefsson and P. Persson, *Conformal array antenna theory and design*. John Wiley & Sons, 2006, vol. 29.
- [142] R. J. Mailloux, *Phased array antenna handbook*. Artech House, 2017.
- [143] J. G. Proakis, *Digital signal processing: principles algorithms and applications*. Pearson Education India, 2001.
- [144] R. W. P. King, G. S. Smith, M. Owens, and T. Wu, “Antennas in matter: Fundamentals, theory, and applications,” *NASA STI/Recon Technical Report A*, vol. 81, 1981.
- [145] B. Vaughn and D. Peroulis, “An updated applied formulation for the Goubau transmission line,” *Journal of Applied Physics*, vol. 126, no. 19, p. 194902, 2019.
- [146] Wikipedia, “Dipole Antenna,” https://en.wikipedia.org/wiki/Dipole_antenna.
- [147] ——, “Twin-Lead,” <https://en.wikipedia.org/wiki/Twin-lead>.
- [148] H. Yagi and S. Uda, “Projector of the sharpest beam of electric waves,” *Proceedings of the Imperial Academy*, vol. 2, no. 2, pp. 49–52, 1926.
- [149] Wikipedia, “Yagi-Uda Antenna,” https://en.wikipedia.org/wiki/Yagi-Uda_antenna.
- [150] D. Dregely, R. Taubert, J. Dorfmüller, R. Vogelgesang, K. Kern, and H. Giessen, “3d optical yagi–uda nanoantenna array,” *Nature communications*, vol. 2, no. 1, pp. 1–7, 2011.
- [151] Antenna-theory.com, “Slot Antenna,” <http://www.antenna-theory.com/antennas/aperture/slot.php>.
- [152] A. D. Olver and P. J. Clarricoats, *Microwave horns and feeds*. IET, 1994, vol. 39.
- [153] B. Thomas, “Design of corrugated conical horns,” *IEEE Transactions on Antennas and Propagation*, vol. 26, no. 2, pp. 367–372, 1978.
- [154] P. J. B. Clarricoats and A. D. Olver, *Corrugated horns for microwave antennas*. IET, 1984, no. 18.
- [155] P. Gibson, “The Vivaldi aerial,” in *1979 9th European Microwave Conference*. IEEE, 1979, pp. 101–105.
- [156] Wikipedia, “Vivaldi Antenna,” https://en.wikipedia.org/wiki/Vivaldi_antenna.
- [157] ——, “Cassegrain Antenna,” https://en.wikipedia.org/wiki/Cassegrain_antenna.
- [158] ——, “Cassegrain Reflector,” https://en.wikipedia.org/wiki/Cassegrain_reflector.
- [159] W. A. Imbriale, S. S. Gao, and L. Boccia, *Space antenna handbook*. John Wiley & Sons, 2012.
- [160] J. A. Encinar, “Design of two-layer printed reflectarrays using patches of variable size,” *IEEE Transactions on Antennas and Propagation*, vol. 49, no. 10, pp. 1403–1410, 2001.

- [161] D.-C. Chang and M.-C. Huang, "Microstrip reflectarray antenna with offset feed," *Electronics Letters*, vol. 28, no. 16, pp. 1489–1491, 1992.
- [162] G. Minatti, M. Faenzi, E. Martini, F. Caminita, P. De Vita, D. González-Ovejero, M. Sabbadini, and S. Maci, "Modulated metasurface antennas for space: Synthesis, analysis and realizations," *IEEE Transactions on Antennas and Propagation*, vol. 63, no. 4, pp. 1288–1300, 2014.
- [163] X. Gao, X. Han, W.-P. Cao, H. O. Li, H. F. Ma, and T. J. Cui, "Ultrawideband and high-efficiency linear polarization converter based on double v-shaped metasurface," *IEEE Transactions on Antennas and Propagation*, vol. 63, no. 8, pp. 3522–3530, 2015.
- [164] D. De Schweinitz and T. L. Frey Jr, "Artificial dielectric lens antenna," Nov. 13 2001, US Patent 6,317,092.
- [165] K.-L. Wong, "Planar antennas for wireless communications," *Microwave Journal*, vol. 46, no. 10, pp. 144–145, 2003.
- [166] H. Nakano, M. Yamazaki, and J. Yamauchi, "Electromagnetically coupled curl antenna," *Electronics Letters*, vol. 33, no. 12, pp. 1003–1004, 1997.
- [167] K. Lee, K. Luk, K.-F. Tong, S. Shum, T. Huynh, and R. Lee, "Experimental and simulation studies of the coaxially fed U-slot rectangular patch antenna," *IEE Proceedings-Microwaves, Antennas and Propagation*, vol. 144, no. 5, pp. 354–358, 1997.
- [168] K. Luk, C. Mak, Y. Chow, and K. Lee, "Broadband microstrip patch antenna," *Electronics letters*, vol. 34, no. 15, pp. 1442–1443, 1998.
- [169] M. Bolic, D. Simplot-Ryl, and I. Stojmenovic, *RFID systems: research trends and challenges*. John Wiley & Sons, 2010.
- [170] D. M. Dobkin, S. M. Weigand, and N. Iyer, "Segmented magnetic antennas for near-field UHF RFID," *Microwave Journal*, vol. 50, no. 6, p. 96, 2007.
- [171] Z. N. Chen, X. Qing, and H. L. Chung, "A universal UHF RFID reader antenna," *IEEE transactions on microwave theory and techniques*, vol. 57, no. 5, pp. 1275–1282, 2009.
- [172] S. Schelkunoff, "Some equivalence theorems of electromagnetics and their application to radiation problems," *The Bell System Technical Journal*, vol. 15, no. 1, pp. 92–112, 1936.
- [173] C.-T. Chen, *Linear system theory and design*. Oxford University Press, Inc., 1998.
- [174] S. H. Schot, "Eighty years of Sommerfeld's radiation condition," *Historia mathematica*, vol. 19, no. 4, pp. 385–401, 1992.
- [175] D. Hinton, *Analects*. Counterpoint, 2014.
- [176] H. Bible, "New Revised Standard Version (NRSV)," *Grand Rapids MI: Zondervan*, 1989.

- [177] V. Rumsey, “Reaction concept in electromagnetic theory,” *Physical Review*, vol. 94, no. 6, p. 1483, 1954.
- [178] R. E. Collin, *Foundations for microwave engineering*. John Wiley & Sons, 2007, also 1966.
- [179] W. J. Hoefer, “The transmission-line matrix method-theory and applications,” *IEEE Transactions on Microwave Theory and Techniques*, vol. 33, no. 10, pp. 882–893, 1985.
- [180] A. Ruehli, G. Antonini, and L. Jiang, *Circuit oriented electromagnetic modeling using the PEEC techniques*. John Wiley & Sons, 2017.
- [181] A. Ishimaru, *Electromagnetic wave propagation, radiation, and scattering from fundamentals to applications*. Wiley Online Library, 2017, also 1991.
- [182] A. E. H. Love, “I. the integration of the equations of propagation of electric waves,” *Philosophical Transactions of the Royal Society of London. Series A, Containing Papers of a Mathematical or Physical Character*, vol. 197, no. 287-299, pp. 1–45, 1901.
- [183] Wikipedia, “Christiaan Huygens,” https://en.wikipedia.org/wiki/Christiaan_Huygens.
- [184] ———, “George Green (mathematician),” [https://en.wikipedia.org/wiki/George_Green_\(mathematician\)](https://en.wikipedia.org/wiki/George_Green_(mathematician)).
- [185] C.-T. Tai, *Dyadic Green’s Functions in Electromagnetic Theory*. PA: International Textbook, Scranton, 1971.
- [186] ———, *Dyadic Green functions in electromagnetic theory*. Institute of Electrical & Electronics Engineers (IEEE), 1994.
- [187] W. Franz, “Zur formulierung des huygensschen prinzip,” *Zeitschrift für Naturforschung A*, vol. 3, no. 8-11, pp. 500–506, 1948.
- [188] Wikipedia, “Faraday Cage,” https://en.wikipedia.org/wiki/Faraday_cage.
- [189] J. A. Stratton, *Electromagnetic Theory*. McGraw-Hill Book Company, Inc., 1941.
- [190] W. Meissner and R. Ochsenfeld, “Ein neuer effekt bei eintritt der supraleitfähigkeit,” *Naturwissenschaften*, vol. 21, no. 44, pp. 787–788, 1933.
- [191] Wikipedia, “Superconductivity,” <https://en.wikipedia.org/wiki/Superconductivity>.
- [192] D. Sievenpiper, L. Zhang, R. F. Broas, N. G. Alexopolous, and E. Yablonovitch, “High-impedance electromagnetic surfaces with a forbidden frequency band,” *IEEE Transactions on Microwave Theory and techniques*, vol. 47, no. 11, pp. 2059–2074, 1999.
- [193] Wikipedia, “Snell’s law,” https://en.wikipedia.org/wiki/Snell's_law.
- [194] H. Lamb, “On sommerfeld’s diffraction problem; and on reflection by a parabolic mirror,” *Proceedings of the London Mathematical Society*, vol. 2, no. 1, pp. 190–203, 1907.

- [195] W. J. Smith, *Modern optical engineering*. McGraw-Hill New York, 1966, vol. 3.
- [196] D. C. O'Shea, T. J. Suleski, A. D. Kathman, and D. W. Prather, *Diffractive optics: design, fabrication, and test*. Spie Press Bellingham, WA, 2004, vol. 62.
- [197] J. B. Keller and H. B. Keller, "Determination of reflected and transmitted fields by geometrical optics," *JOSA*, vol. 40, no. 1, pp. 48–52, 1950.
- [198] G. A. Deschamps, "Ray techniques in electromagnetics," *Proceedings of the IEEE*, vol. 60, no. 9, pp. 1022–1035, 1972.
- [199] R. G. Kouyoumjian and P. H. Pathak, "A uniform geometrical theory of diffraction for an edge in a perfectly conducting surface," *Proceedings of the IEEE*, vol. 62, no. 11, pp. 1448–1461, 1974.
- [200] R. Kouyoumjian, "The geometrical theory of diffraction and its application," in *Numerical and Asymptotic Techniques in Electromagnetics*. Springer, 1975, pp. 165–215.
- [201] S.-W. Lee and G. Deschamps, "A uniform asymptotic theory of electromagnetic diffraction by a curved wedge," *IEEE Transactions on Antennas and Propagation*, vol. 24, no. 1, pp. 25–34, 1976.
- [202] Wikipedia, "Fermat's principle," https://en.wikipedia.org/wiki/Fermat's_principle.
- [203] N. Yu, P. Genevet, M. A. Kats, F. Aieta, J.-P. Tetienne, F. Capasso, and Z. Gaburro, "Light propagation with phase discontinuities: generalized laws of reflection and refraction," *Science*, vol. 334, no. 6054, pp. 333–337, 2011.
- [204] X. Ni, N. K. Emani, A. V. Kildishev, A. Boltasseva, and V. M. Shalaev, "Broadband light bending with plasmonic nanoantennas," *Science*, vol. 335, no. 6067, pp. 427–427, 2012.
- [205] A. Sommerfeld, *Partial differential equations in physics*. Academic Press, 1949, vol. 1.
- [206] R. Haberman, *Elementary applied partial differential equations*. Prentice Hall Englewood Cliffs, NJ, 1983, vol. 987.
- [207] G. A. Deschamps, "Gaussian beam as a bundle of complex rays," *Electronics letters*, vol. 7, no. 23, pp. 684–685, 1971.
- [208] J. Enderlein and F. Pampaloni, "Unified operator approach for deriving hermite–gaussian and laguerre–gaussian laser modes," *JOSA A*, vol. 21, no. 8, pp. 1553–1558, 2004.
- [209] D. L. Andrews, *Structured light and its applications: An introduction to phase-structured beams and nanoscale optical forces*. Academic Press, 2011.
- [210] J. W. Strutt, "Xv. on the light from the sky, its polarization and colour," *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, vol. 41, no. 271, pp. 107–120, 1871.

- [211] L. Rayleigh, “X. on the electromagnetic theory of light,” *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, vol. 12, no. 73, pp. 81–101, 1881.
- [212] S. Sun, Y. G. Liu, W. C. Chew, and Z. Ma, “Calderón multiplicative preconditioned efie with perturbation method,” *IEEE Transactions on Antennas and Propagation*, vol. 61, no. 1, pp. 247–255, 2012.
- [213] G. Mie, “Beiträge zur optik trüber medien, speziell kolloidaler metallösungen,” *Annalen der physik*, vol. 330, no. 3, pp. 377–445, 1908.
- [214] Wikipedia, “Mie scattering,” https://en.wikipedia.org/wiki/Mie_scattering.
- [215] L. B. Felsen and N. Marcuvitz, *Radiation and scattering of waves*. John Wiley & Sons, 1994, also 1973, vol. 31.
- [216] P. P. Ewald, “Die berechnung optischer und elektrostatischer gitterpotentiale,” *Annalen der physik*, vol. 369, no. 3, pp. 253–287, 1921.
- [217] E. Whitaker and G. Watson, *A Course of Modern Analysis*. Cambridge Mathematical Library, 1927.
- [218] J. Kong, “Electromagnetic fields due to dipole antennas over stratified anisotropic media,” *Geophysics*, vol. 37, no. 6, pp. 985–996, 1972.
- [219] Wikipedia, “FLOPS,” <https://en.wikipedia.org/wiki/FLOPS>.
- [220] ——, “Computer,” <https://en.wikipedia.org/wiki/computer>.
- [221] W. C. H. McLean, *Strongly elliptic systems and boundary integral equations*. Cambridge University Press, 2000.
- [222] G. C. Hsiao and W. L. Wendland, *Boundary integral equations*. Springer, 2008.
- [223] P. K. Banerjee and R. Butterfield, *Boundary element methods in engineering science*. McGraw-Hill London, 1981, vol. 17.
- [224] O. C. Zienkiewicz, R. L. Taylor, P. Nithiarasu, and J. Zhu, *The finite element method*. McGraw-Hill London, 1977, vol. 3.
- [225] J.-F. Lee, R. Lee, and A. Cangellaris, “Time-domain finite-element methods,” *IEEE Transactions on Antennas and Propagation*, vol. 45, no. 3, pp. 430–442, 1997.
- [226] J. L. Volakis, A. Chatterjee, and L. C. Kempel, *Finite element method electromagnetics: antennas, microwave circuits, and scattering applications*. John Wiley & Sons, 1998, vol. 6.
- [227] J.-M. Jin, *The finite element method in electromagnetics*. John Wiley & Sons, 2015.
- [228] G. Strang, *Linear algebra and its applications*. Academic Press, 1976.
- [229] Cramer and Gabriel, *Introduction a l'analyse des lignes courbes algebriques par Gabriel Cramer...* chez les freres Cramer & Cl. Philibert, 1750.

- [230] J. A. Schouten, *Tensor analysis for physicists*. Courier Corporation, 1989.
- [231] A. C. Polycarpou, “Introduction to the finite element method in electromagnetics,” *Synthesis Lectures on Computational Electromagnetics*, vol. 1, no. 1, pp. 1–126, 2005.
- [232] J. P. A. Bastos and N. Sadowski, *Electromagnetic modeling by finite element methods*. CRC press, 2003.
- [233] Ö. Özgün and M. Kuzuoglu, *MATLAB-based Finite Element Programming in Electromagnetic Modeling*. CRC Press, 2018.
- [234] R. Coifman, V. Rokhlin, and S. Wandzura, “The fast multipole method for the wave equation: A pedestrian prescription,” *IEEE Antennas and Propagation magazine*, vol. 35, no. 3, pp. 7–12, 1993.
- [235] J. Song, C.-C. Lu, and W. C. Chew, “Multilevel fast multipole algorithm for electromagnetic scattering by large complex objects,” *IEEE Transactions on Antennas and Propagation*, vol. 45, no. 10, pp. 1488–1493, 1997.
- [236] W. H. Press, S. A. Teukolsky, W. T. Vetterling, and B. P. Flannery, *Numerical recipes 3rd edition: The art of scientific computing*. Cambridge University Press, 2007.
- [237] K. Yee, “Numerical solution of initial boundary value problems involving maxwell’s equations in isotropic media,” *IEEE Transactions on Antennas and Propagation*, vol. 14, no. 3, pp. 302–307, 1966.
- [238] A. Taflove, “Review of the formulation and applications of the finite-difference time-domain method for numerical modeling of electromagnetic wave interactions with arbitrary structures,” *Wave Motion*, vol. 10, no. 6, pp. 547–582, 1988.
- [239] A. Taflove and S. C. Hagness, *Computational electrodynamics: the finite-difference time-domain method*. Artech house, 2005, also 1995.
- [240] W. Yu, R. Mittra, T. Su, Y. Liu, and X. Yang, *Parallel finite-difference time-domain method*. Artech House Norwood, 2006.
- [241] D. Potter, “Computational physics,” 1973.
- [242] W. F. Ames, *Numerical methods for partial differential equations*. Academic press, 2014, also 1977.
- [243] K. W. Morton, *Revival: Numerical Solution Of Convection-Diffusion Problems (1996)*. CRC Press, 2019.
- [244] K. Aki and P. G. Richards, *Quantitative seismology*, 2002.
- [245] F. B. Hildebrand, *Introduction to numerical analysis*. Courier Corporation, 1987.
- [246] W. C. Chew, “Electromagnetic theory on a lattice,” *Journal of Applied Physics*, vol. 75, no. 10, pp. 4843–4850, 1994.

- [247] J. v. Neumann, *Mathematische Grundlagen der Quantenmechanik*, Berlin. Springer, New York, Dover Publications, 1943.
- [248] R. Courant, K. Friedrichs, and H. Lewy, “Über die partiellen differenzengleichungen der mathematischen physik,” *Mathematische annalen*, vol. 100, no. 1, pp. 32–74, 1928.
- [249] M. Desbrun, A. N. Hirani, M. Leok, and J. E. Marsden, “Discrete exterior calculus,” *arXiv preprint math/0508341*, 2005.
- [250] W. C. Chew, “Vector potential electromagnetics with generalized gauge for inhomogeneous media: Formulation,” *Progress In Electromagnetics Research*, vol. 149, pp. 69–84, 2014.
- [251] J.-P. Berenger, “A perfectly matched layer for the absorption of electromagnetic waves,” *Journal of computational physics*, vol. 114, no. 2, pp. 185–200, 1994.
- [252] W. C. Chew and W. H. Weedon, “A 3d perfectly matched medium from modified maxwell’s equations with stretched coordinates,” *Microwave and optical technology letters*, vol. 7, no. 13, pp. 599–604, 1994.
- [253] W. C. Chew, J. Jin, and E. Michielssen, “Complex coordinate system as a generalized absorbing boundary condition,” in *IEEE Antennas and Propagation Society International Symposium 1997. Digest*, vol. 3. IEEE, 1997, pp. 2060–2063.
- [254] B. Bapat, “Newton’s rings,” http://www.iiserpune.ac.in/~bhasbapat/phy221_files/NewtonRing.pdf.
- [255] Wikipedia, “Double-slit experiment,” https://en.wikipedia.org/wiki/Double-slit_experiment.
- [256] Shmoop.Com, “Young’s double-slit,” <https://www.shmoop.com/optics/young-double-slit.html>.
- [257] Wikipedia, “John Dalton,” https://en.wikipedia.org/wiki/John_Dalton.
- [258] ——, “Max Planck,” https://en.wikipedia.org/wiki/Max_Planck.
- [259] ——, “Photoelectric effect,” https://en.wikipedia.org/wiki/Photoelectric_effect.
- [260] ——, “Louis de Broglie,” https://en.wikipedia.org/wiki/Louis_de_Broglie.
- [261] ——, “Newton’s laws of motion,” https://en.wikipedia.org/wiki/Newton's_laws_of_motion.
- [262] ——, “Quantum electrodynamics,” https://en.wikipedia.org/wiki/Quantum_electrodynamics.
- [263] C. Christopoulos, *The transmission-line modeling method: TLM*. IEEE New York, 1995, vol. 221.

- [264] Wikipedia, “William Rowan Hamilton,” https://en.wikipedia.org/wiki/William_Rowan_Hamilton.
- [265] W. C. Chew, A. Y. Liu, C. Salazar-Lazaro, D. Na, and W. E. I. Sha, “Hamilton equation, commutator, and energy conservation,” *Quantum Report*, pp. 295–303, Dec 2019.
- [266] Wikipedia, “Gaussian beam,” https://en.wikipedia.org/wiki/Gaussian_beam.
- [267] M. Kira and S. W. Koch, *Semiconductor quantum optics*. Cambridge University Press, 2011.
- [268] Wikipedia, “Quantum harmonic oscillator,” https://en.wikipedia.org/wiki/Quantum_harmonic_oscillator.
- [269] ——, “Roy J. Glauber,” https://en.wikipedia.org/wiki/Roy_J._Glauber.
- [270] ——, “E.C. George Sudarshan,” https://en.wikipedia.org/wiki/E._C._George_Sudarshan.
- [271] C. Gerry, P. Knight, and P. L. Knight, *Introductory quantum optics*. Cambridge University Press, 2005.