Recommendation: please consult with the course instructor before purchasing any material.

1004   Hambley, Allan R.**, Electrical Engineering Principles and Applications** (7E), New York: Pearson (2017), ISBN: 9780134484143.

2024   Hambley, Allan R.**, Electrical Engineering Principles and Applications** (7E), New York: Pearson (2017), ISBN: 9780134484143.

      Required Hardware:
      The Lab-in-A-Box kit previously used in ECE 1004.

2054   **(Applied Electrical Theory – ME students only)**
      Allan R. Hambley, **Electrical Engineering Principles and Applications Plus Mastering Engineering with Pearson eText – Access Card Package**, 7th edition, Pearson. ISBN: 9780134712871.

      Students can opt to purchase:
      Book + Modified Mastering access card: 0134680618
               or
      *SVE + Modified Mastering access card: 0134680626
               or
      Modified Mastering access card: 0134487001

      *SVE= Student Value Edition which is the loose leaf/ three-hole punched version of the text.

2164   J. J. Sellers, **Understanding Space: An Introduction to Astronautics** (3rd Edition), McGraw Hill, 2005. ISBN: 9780077230302
      CROSS LISTED WITH AOE 2664
      (ECE teaches Spring 2025)

2214   Ellingson, Steven W. **Electromagnetics** (I). Blacksburg, VA: VT Publishing, 2018, 225. (Available at: **https://doi.org/10.21061/electromagnetics-vol-1 CC BY-SA 4.0.**) **Author offers free access to this book.**

      Neamen, D. A. **Microelectronics Circuit Analysis and Design**. 4th edition, New York: McGraw-Hill Education, 2009, 1392. ISBN: 9780073380643.

      Required Course Materials:
      The Lab-in-A-Box kit that was previously used in 1004 and 2024.

2514   Riley, David and Kenny A. Hunt. **Computational Thinking For The Modern Problem Solver**. i, Boca Raton Florida: CRC Press, 2014, 405. ISB: 9781466587779
      Available on the VT online library:

Required Software:
1.   Modeling and simulation software, such as MATLAB and Simulink.
2.   Linux virtual machine and software development environment (open source).
3.   Unmanned aircraft simulation and ground station software (open source).

Required Field Equipment:
A technology platform suitable for project-based learning, such as a ready-to-fly quadcopter (provided by the department).

2544   M. Morris Mano, Charles R. Kime, Tom Martin, **Logic and Computer Design Fundamentals**, 2015. 5th edition, Pearson. ISBN: 9780133760637.

2564   **No textbook required**

2714   Oppenheim, A. V., Willsky, A. S., and Nawab, S. H. **Signals and Systems**. ii, Pearson, 1996, 1000. ISBN: 9780138147570

2804   **No textbook required**

3004   Charles K. Alexander and Matthew N. O. Sadiku, **Fundamentals of Electric Circuits**, 7th edition, McGraw-Hill. ISBN: 9781260226409.

3054   Hambley Allan R**., Electrical Engineering Principles and Application** (7E), New York: Pearson (2017), ISBN: 9780134484143.
Students should have from taking 2054.

3074   **No textbook required.** All required materials will be made available electronically.

3105   Ellingson, Steven W. (2018) **Electromagnetics, Vol. 1**. Blacksburg, VA: VT Publishing. ISBN: 9780997920192.
Free Electronic Book for students: **https://doi.org/10.21061/electromagnetics-vol-1 CC BY-SA 4.0**   **Author offers free access to this book.**
Recommended:
Fawwz T. Ulaby, Umberto Ravaioli, **Fundamentals of Applied Electromagnetics**, 8th edition, Pearson. ISBN: 978-0135199008. **NOTE: This ISBN is for the Pearson eText access card.**

3106   Ellingson, Steven W. (2020) **Electromagnetics, Vol. 2**. Blacksburg, VA: Virginia Tech Publishing. ISBN: 9781949373929
Free Electronic Book for students: **https://doi.org/10.21061/electromagnetics-vol-2 CC BY-SA 4.0** **Author offers free access to this book.**

Recommended:

Fawwz T. Ulaby, Umberto Ravaioli, **Fundamentals of Applied Electromagnetics**, 8th edition, Pearson. ISBN: 9780135199008. **NOTE: This ISBN is for the Pearson eText access card.**

3134 Kasap, S.O., **Optoelectronics & Photonics: Principles & Practices**, 2nd Edition, Pearson, 2012, ISBN: 9780132151498

3204 Donald Neamen, **Microelectronics Circuit Analysis and Design**, 4th edition, 2009. McGraw-Hill. ISBN: 9780073380643.

3214 Donald Neamen, **Semiconductor Physics and Devices,** 4th edition, McGraw-Hill. ISBN: 9780073529585

3254 **(Applied Electrical Theory – ME students only)**
Allan R. Hambley, **Electrical Engineering Principles and Applications– Access Card Package**, 7th edition, PEARSON. ISBN: 9780134712871.

Students can opt to purchase:
Book + Modified Mastering access card: 0134680618
or
*SVE + Modified Mastering access card: 0134680626
or
Modified Mastering access card: 0134487001

*SVE= Student Value Edition which is the loose leaf/ three-hole punched version of the text.
STUDENTS SHOULD HAVE FROM TAKING ECE 2054

3274 No textbook required. ECE Department, **ECE 3274 Lab Manual.** Available on-line.

3304 J. D. Glover and M. S. Sarma, **Power System Analysis and Design**, Cengage Engineering, 6th edition. ISBN: 9781305632134.

Robert W. Erikson and Dragan Maksimovic, **Fundamentals of Power Electronics**, 2nd edition, 2001, Springer Science & Business Media, Inc. ISBN: 9780792372707.

3354 No textbook required. ECE Department, *ECE 3354 Lab Manual.* Available on-line.

3504 Patterson, D., & Hennessey, J. (2013). **Computer Organization and Design: The Hardware/Software Interface**, 5th edition. Morgan Kaufmann Publishers Inc. Pp. 800. ISBN: 9780124077263.

Required Software:
Architecture simulator as specified by the instructor. There are several simulators available in the public domain at no cost.

3514 Carrano, F. & Henry, T. (2016). **Data abstraction and problem solving with C++: Walls and mirrors**, (7th Edition) London, United Kingdom: Pearson. pp. 864.ISBN: 9780134463971.

3544 John Wakerly, (2017). **Digital Design Principles and Practices**, (5th edition) Pearson. ISBN: 9780134460093.

3564 James F. Kurose and Keith W. Ross, **Computer Networking: A Top-Down Approach**. Pearson. 8th edition, 2021. ISBN: 9780135928615. Electronic Book only. Paper copy available for rental only. ISBN: 9780136681557

3574 David Thomas and Andrew Hunt. **The Pragmatic Programmer.** Addison-Wesley, 2nd edition. 2020. ISBN: 9780135957059.
Recommended:
Martin, Robert C. (2009). **Clean Code**, Pearson, ISBN:9780132350884

Hunt, Andrew and Thomas, David, (2000). **The Pragmatic Programmer**. Addison Wesley. ISBN: 9780201616224

3604 Ellingson, S.W. (2016). **Radio Systems Engineering**, Cambridge University Press, pp. 650. ISBN: 9781107068285

3614 Grami, Ali (2015). **Introduction to Digital Communications.** Academic Press (Elsevier), pp. 604. ISBN: 9780124076822

3704 Oppenheim, A. V., Willsky, A. S., and Nawab, S. H. (1996). **Signals and Systems**. Pearson. 2E. pp. 1000. ISBN: 9780138147570

3714 Nise, Norman S. (2020). **Control Systems Engineering**. 8th Edition, John Wiley and Sons. 800pp. ISBN: 9781119721406

4114 Stutzman and Thiele, **Antenna Theory and Design**, 3rd edition, John Wiley. ISBN: 9780470576649.

4124 John S. Seybold, **Introduction to RF Propagation**, John Wiley, 1st edition, 2005. ISBN: 9780471655961.

4144 T.-C. Poon and J.-P. Liu, **Introduction to Modern Digital Holography**, Cambridge Univ. Press. 1st edition, 2014. ISBN 9781107016705.

4174 Prölss, G. W., **Physics of the earth's space environment**,1st Ed. Berlin: Springer, 2004. Pp. xv, 513. ISBN: 9783540214267. **Taught by AOE Spring 2025 (Cross-listed with AOE)**

4234   Plummer, James D. and Griffin, Peter B., **Integrated Circuit Fabrication Science and Technology,** 1st edition**,** 2024**,** Cambridge University Press**,** ISBN: 9781009303583

4254   **No textbook required. Co-located with ECE 5224**

4314   Kersting, W. H., (2018), **Distribution System Modeling and Analysis**, 4th Ed., CRC Press, 1-518. ISBN: 9781498772136 (hardcover). ISBN: 9781315120782 (eBook)

Cooper Power Systems, (1990), **Electrical Distribution System Protection**, 3rd Edition, 1-165. **(The electronic version of this manual will be made available to students by the instructor).**

4354   Stanley H. Horowitz and Arun G. Phadke, **Power System Relaying**, 4th edition. John Wiley. ISBN: 9781118662007.

4364/5374G
   No textbook required. Instructor provides a free online textbook.

4414/CS 4224   No textbook required.. (Cross-listed with CS) Taught by CS Spring 2025

Optional Books:
- Linux Kernel Development, 3rd Edition, by Robert Love ISBN: 9780672329463
- Linux Kernel Programming: A comprehensive and practical guide to kernel internals, writing modules, and kernel synchronization , Second Edition, by Kaiwan N. Billimoria ISBN: 9781803232225
- Linux Device Drivers, 3rd Edition, by Jonathan Corbet, Alessandro Rubini, and Greg Kroah-Hartman ISBN: 9780596005900

4424/CS4824
   (Cross-listed with CS) Taught by CS Spring 2025
   No textbook required

4514   No textbook required

4524   Stuart Russell and Peter Norvig, **Artificial Intelligence: A Modern Approach,** 4th Edition, 2020. 1152 pp. Pearson. ISBN: 9780134610993.

4550/5550G
   Giorgio C. Buttazzo, **Hard Real-Time Computing Systems: Predictable Scheduling Algorithms and Applications**, 3rd edition, Springer. ISBN: 9781461406754
   Same room as 5550G

4560   Ed Skoudis with Tom Liston, **Counter Hack Reloaded**, 2nd edition, Prentice-Hall. ISBN: 9780131481046.

4564   **No cost to students** (Full-text available thru VT Library Safari service)

S. Monk, **Programming the Raspberry Pi: Getting Started with Python,** Tab Books, 2012, ISBN 978-0071807838.

B. Rhodes and J. Goerzen, **Foundations of Python Network Programming**, Apress, 3rd ed., 2014, ISBN 978-1430258544

TJ O'Connor, **Violent Python : A Cookbook for Hackers, Forensic Analysts, Penetration Testers and Security Engineers, Elsevier/Syngress**, 2012, ISBN: 9781597499644

P. Waher, **Learning Internet of Things**, Packt Publishing, 2015, ISBN: 9781783553532
Other resources will be available from on-line sites including the Virginia Tech Library's e-book and full-text database offerings.

Each student will receive the following hardware for use during the semester:
   Raspberry Pi 3 - Model B
   32 GB MicroSD Card
   Power Supply with micro-USB Cable

4644   Timothy Pratt and Jeremy Allnut, **Satellite Communications**, 3rd ed., 2020, John Wile & Sons Ltd. E-book ISBN: 9781119482055, Hardcover ISBN 9781119482178.

4704   **No textbook required.** Consult with the instructor.

4805 & 4806   (Senior Design Project)

Patrick Lencioni, **The 5 Dysfunctions of a Team**, 2010. John Wiley & Sons. ISBN: 9780787960759.

4944   Required reference materials will be made available electronically.

4984   **SS: Intro to Quantum Eng Lab-Wayne Scales**
   No Textbook Required

Recommended:
Wong, Thomas, **Introduction to Classical and Quantum Computing**, Root Groove, 2022, pp. 382. ISBN: 9798985593105
Free pdf online:
https://www.thomaswong.net/introduction-to-classical-and-quantum-computing-1e3p.pdf

5106 Jian-Ming Jin. **Theory and Computation of Electromagnetic Fields**, 2010, Wiley. 2nd edition, ISBN 9781119108047

5174 F. F. Chen**, Introduction to Plasma Physics and Controlled Fusion,** 3rd edition. Springer. ISBN 9783319223087.
(Cross-listed and taught by AOE Spring 2025)

5205 Dieter K. Schroder, **Semiconductor Material and Device Characterization**, 2006, 3rd edition, John Wiley. ISBN 9780471739067.

5210 Marc J. Madou, **Fundamentals of Microfabrication and Nanotechnology**. 3rd edition, CRC Press. 2011. ISBN: 9780849331800

Recommended:
Stephen D. Senturia, **Microsystem Design,** 2nd edition*,* Springer. ISBN: 9780792372462.

5224 No textbook required. **Co-located with ECE 4254.**

5244 No textbook required.

5274 No textbook required
Lecture notes provided by the instructor via website, "Modeling and Control of Three-Phase PWM Converters."
A list of publications related to the subject.

5284 No textbook required

5344 No textbook required

5374G/4364 No textbook required

5404 Behzad Razavi.(2016) **Design of Analog CMOS Integrated Circuits,** McGraw Hill. 2nd edition. ISBN: 9780072524932.

Recommended:
Baker, R. Jacob. **CMOS Circuit Design, Layout, and Simulation**, 3rd Edition, Wiley-IEEE Press, 2010, Pp 1072, ISBN 9780470881323.

Provided: Cadence Virtuoso Custom IC Design Tools Students will be also provided with reading material and papers to read. Paper and Lecture Note

5414/CS 5264 No textbook required.. **(Cross-listed with CS) Taught by CS Spring 2025**

Optional Books:
- Linux Kernel Development, 3rd Edition, by Robert Love ISBN: 978-0672329463

- Linux Kernel Programming: A comprehensive and practical guide to kernel internals, writing modules, and kernel synchronization , Second Edition, by Kaiwan N. Billimoria ISBN: 978-1803232225
- Linux Device Drivers, 3rd Edition, by Jonathan Corbet, Alessandro Rubini, and Greg Kroah-Hartman ISBN: 978-0596005900

5424   Kevin Murphy, **Machine Learning: A Probabilistic Perspective**, MIT Press, 2012. ISBN: 9780262018029.

5434   Platzer A. (2018). **Logical Foundations of Cyber-Physical Systems**. Springer. ISBN: 9783319635880.

5444   Shanahan, M. (2015). **The Technological Singularity**. Cambridge, MA: MIT Press. Pp. xv, 272. The book is available for free and online from the VT library.

5464   Kelleher, J. Mac Namee, B., & D'Arcy, A. (2020). **Fundamentals of machine learning for predictive data analytics: Algorithms, worked examples, and case studies** (2nd ed.). MIT Press. pp. 856. ISBN: 9780262044691.

5480   Pfleeger, Charles P., Shari Lawrence Pfleeger, and Lizzie Coles-Kemp. 2024. Security in Computing. Sixth edition. (1040 pages) . Boston: Addison-Wesley Professional. (on-line – MIT only)
Available free online:
 https: //www.oreilly.com/library/view/-/9780137891375/.

5484   Null, Linda (2024). **The Essentials of Computer Organization and Architecture.** Sixth edition. Burlington, Massachusetts: Jones & Bartlett Learning. Hard copy ISBN: 9781284259438
free at VT Libraries online ISBN: 9781284259445 . Essentials of Computer Organization and Architecture - Virginia Polytechnic Institute and State University (exlibrisgroup.com) (on-line – MIT only)

5494   Poole, D.L. & Mackworth, A.K. (2023). **Artificial intelligence: Foundations of computational agents**, 3rd Edition. Cambridge University Press. Free online for students: **https://artint.info/3e/html/ArtInt3e.html** ISBN: 9781009258197.

5544/CS5544   Aho, Lam, Sethi & Ullman, **Compilers: Principles, Techniques, and Tools.** 2nd Edition. Pearson. 2007. 1040pp. ISBN: 9780321486813

5545   Weste and Harris, **CMOS VLSI Design, A Circuits and Systems Perspective**, 4th edition, 2004. Pearson. ISBN: 9780321547743.

Recommended:

Tront, Joseph G.*, **PSpice for Basic Microelectronics**, McGraw-Hill, 2008.
ISBN 9780073529479.

5550G/4550 Giorgio C. Buttazzo, **Hard Real-Time Computing Systems: Predictable Scheduling Algorithms and Applications**, 3rd edition, Springer. ISBN: 9781461406754.

5560/CS5560 CS teaches Spring 2025

William Stallings, **Cryptography and Network Security – Principles and Practices**, 7th edition, Pearson. 2016. ISBN: 9780134444284.

5566/CS5566 No textbook required

5580 No textbook required

5586 William Stallings; Lawrie Brown**, *Computer Security: Principles and Practice*,** Pearson, 4th edition. ISBN: 9780134794105. **(On-Line – MIT Only)**

5590/CS5590 CS teaches Spring 2025
            No textbook required

5606 H. Vincent Poor**, An Introduction to Signal Detection and Estimation,** 2nd edition, Springer. 1994. ISBN: 9781441928375.

5620 John G. Proakis and Dimitris G. Manolakis, **Digital Signal Processing: Principles, Algorithms, and Applications**, 4th edition, 2006, Prentice-Hall. Student edition of Matlab. ISBN: 9780131873742.

5634 Thomas M. Cover and Joy A. Thomas, **Elements of Information Theory,** 2nd Edition 2006, Wiley. ISBN: 9780471241959.

5636 M.A. Richards, **Fundamentals of Radar Signal Process,** 1E, 2005, McGraw-Hill, ISBN: 9780071444743.

5654 John Proakis, **Digital Communications**, 5th edition, 2008. McGraw-Hill. ISBN 9780071263788.

5664 Nishith Tripathi and Jeffrey H. Reed, **Cellular Communications: A Comprehensive and Practical Guide**, 2014, Wiley-IEEE Press. ISBN: 9780470472071.

5714 **(Zoom course – originates Northern VA)** Class notes and papers will be provided. No textbook required

5734 **Cross-listed with AOE 5734 & ME 5584-Taught by AOE Spring 2025**

Boyd, S. & Vandenberghe, L. (2004). **Convex Optimization.** New York: Cambridge University Press. Pp. xiv, 730. ISBN: 9780521833783 (Hardcover)

5764/AOE5764/ME5564   Taught by ME Spring 2025
No textbook required. All course materials will be provided by the instructor through course notes.

5944   No textbook required

5984   SS: Quantum Information Technologies (MIT-Zin Lin)

Sutor, Robert, **Dancing with Qubits.** Packt Publishing. 2019. ISBN: 9781838827366

5984   SS: Adv Satellite Communication (J. Ruohoniemi)
Timothy Pratt and Jeremy Allnut, **Satellite Communications**, 3rd ed., 2020, John Wiley & Sons Ltd. E-book ISBN: 9781119482055, Hardcover ISBN: 9781119482178.

5984   SS: NextG Mobile Networks (MIT-A. Soysal)
No textbook required

5984   SS: Bioelectronics (X. Jia)
No textbook required

Recommended reference text:
J. H. Martin et al., **in Principles of Neuroscience**, edited by E. R. Kandel, J.H. Schwartz, and T. J. Jessel (Norwalk: Appleton and Lange, 2000), p. 340-352. ISBN: 9780071390118

Fundamentals of microfabrication 2nd or 3rd edition by M.J. Madou. ISBN: 9780849308260

Flexible Electronics: **Materials and Applications** (Electronic Materials: Science & Technology) by William S. Wong and Alberto Salleo (Paperback - Dec 8, 2010) Springer, 480pp Liens Moodle. ISBN: 9780387743622

5984   SS: Deep Reinforcement Learning (J. Xuan)
No textbook Required

5984   SS: RFIC Design (J. Walling)
Razavi, Behzad. **RF Microelectronics**, 2nd Edition, Prentice Hall, 2011. ISBN-13: 9780137134731.

5984   SS: PE & Sys for Future Grid (R. Zhang)
No Textbook Required

5984   SS: Quantum Engineering Lab (W. Scales)
No Textbook Required

Recommended:
Wong, Thomas, **Introduction to Classical and Quantum Computing**, Root Groove, 2022, pp. 382. ISBN: 9798985593105
Free pdf online:
https://www.thomaswong.net/introduction-to-classical-and-quantum-computing-1e3p.pdf

5984   SS: Critical Eng of Emerging Tech (N. Tryfona)
No Textbook Required

5984   SS: Industry Topics & Professionalism (T. Talty)
No textbook required

6116   Stutzman, Warren L. **Antenna Theory and Design.** WILEY, 3rd Edition, 2012. ISBN: 9780470576649

6504   TS: Activ Inferenc Autom Sys-C. Wyatt
No textbook required **- Primary readings from journal publications.**

Recommended:
Parr T., Pezzulo G., Friston K.J, **Active Inference: The Free Energy Principle in Mind, Brain, and Behavior**, The MIT Press, 312 pp., 2022. ISBN: 9780262045353

6524   No textbook required

Recommended:
Free for students
Goodfellow, Ian & Bengio, Yoshua and Courville, Aaron. **Deep Learning**, MIT Press, 2016, http://www.deeplearningbook.org/. 780 pages.

**6744   No textbook required. Taught by AOE Spring 2025
(CROSS-LISTED with AOE6744/ME6544)**

6774   No textbook required. Taught by ISE Spring 2025 (CROSS-LISTED AOE 6774 /ME6574 /ISE6574)

Recommended:
Lavretsky, Eugene & Wise, Kevin. (2013) R**obust and Adaptive Control: With Aerospace Applications.** Springer. ISBN: 9781447143956. The following link goes to the PDF version of the textbook.
https://link.springer.com/content/pdf/10.1007/978-1-4471-4396-3.pdf

Ioannou, Petros & Sun, Jing.(2012) **Robust Adaptive Control**. Dover Publications. 1st edition. ISBN: 9780486498171

Khalil, Hassan. (2001). **Nonlinear Systems,** Pearson. 3rd edition. ISBN: 9780130673893