

COURSE OVERVIEW

This course explores the different layers of computing technology within your smartphone. We begin at the hardware level, covering digital logic beginning with transistors and moving up to finite state machines. In the second part of the course, we build on this material and discuss how computers are organized and designed, including how the hardware and software interact. Finally, we learn the basics of programming. These three parts give a broad coverage of the technology that enables your smartphone to operate. Then, we move beyond operation into performance, exploring advanced methods to speed up computers, including pipelining, multi-threading, and multi-core processors. Finally, we close the course with an overview of actual processors used in smartphones. Assignments throughout the course are tailored to build your understanding and solve problems. Hands on work using a simulator permits designing a small working computer that functions using the same basic computing principles as your smartphone.

To open the course schedule in a new window please [click here](#). You can print by right clicking on your mouse.

LEARNING OUTCOMES

By the end of the course, you will be able to:

- Describe how a smartphone processor works.
- Explain computer system design from binary information to programming.
- Design a small working computer.
- Describe common techniques used to make computers fast.

PREREQUISITES

None

WHAT WILL I BE GRADED ON? (WHAT COUNTS TOWARDS CERTIFICATE COMPLETION?)

Course assessments consist of three types of problems:

- Check Your Understanding problems occur after many of the video lecture segments. They are designed to assess whether you can apply the concepts in the lectures to answer questions and solve problems. Point values are found next to the question title. You have two attempts to submit the correct answer for most of these problems.
- Homework problems are in separate modules following most of the content modules. These are more difficult application problems that will usually require more time to complete. Point values are found next to the question title. You have two attempts to submit the correct answer for most of these problems.
- Lab problems are in separate modules and involve the use of a tool to design and build a small working computer. Point values are found next to the question title. You will have unlimited tries for lab problems.

CERTIFICATION

Participants who achieve the passing mark of **60%** or more correct responses on the Check Your Understanding, Problems and Labs (each counts as $\frac{1}{3}$ of your final grade) at the end of each Module will earn a certificate of mastery.

These certificates will indicate you have successfully completed the course, but will not include a specific grade. Certificate 03/26/2015 09:28 AM by edX under the name of CornellX. These certificates are issued free of charge.

The pass rate for the Verified Certificate is the same as the Honor Code Certificate.

COURSE GUIDELINES

Discussion guidelines

How to Use Jade

CONTENT

There are no required textbooks for this course. However, the following two textbooks are suggested:

Patt, Y. and Patel, S. (2004). Introduction to Computing Systems: From Bits & Gates to C & Beyond. McGraw Hill. **(Covers content in Weeks 1-6)**

The Patt and Patel text may be purchased directly from McGraw Hill Bookstore. You may purchase the full (ISBN: 9781308478845) ebook for \$103.31 USD or a version with selected chapters (ISBN: 9781308478869) that only covers the content in this course for \$57.14 USD.

Please note that you must select the United States as your country. Additional information on how to purchase by credit card and download the ebook can be found by clicking [here](#).

If the above link doesn't work please copy and paste the following URL into your browser. <https://create.mheducation.com/shop/>

Student Resources (PowerPoints, selected solutions and Appendices A, B, C, D, and E) may be accessed here. If this link doesn't work please copy and paste the following URL into your web browser: http://higher.ed.mheducation.com/sites/0072467509/student_view0/index.html

Harris, D. M. and Harris, S. L. (2012). Digital Design and Computer Architecture, 2nd Edition. Morgan Kaufmann. (eBook ISBN :9780123978165, Print Book ISBN :9780123944245). **(Covers content in Weeks 7-8)**

A print copy or ebook can be purchased from the Elsevier store. If this link doesn't work please copy and paste the following URL into your web browser: <http://store.elsevier.com/Digital-Design-and-Computer-Architecture/David-Harris/isbn-9780123978165/>

Exploring Engineering includes complete interviews of our guests (Chris Batten; Adam Kerin; Rajit Manohar; and Yale Patt) as well as information related to studying engineering and engineering careers.

HONOR CODE AND ACADEMIC INTEGRITY

This course is offered online and we encourage collaboration and help between students, but please avoid asking for and posting final answers. Violations of the honor policy undermine the purpose of education and the academic integrity of the course. We expect that all work submitted will be a reflection of one's own original work and thoughts.

Please review our discussion guidelines to understand how we expect our students to conduct themselves in this course. Additionally all students are expected to follow the edX Honor Code, available at <https://www.edx.org/honor>.

ACKNOWLEDGEMENTS

Portions of the powerpoints (Author: Byrd, Greg) from Introduction to Computing Systems: From Bits & Gates to C & Beyond, 2e, © 2004, by Patt & Patel are used with permission from McGraw-Hill Education Material. ISBN: 0072467509

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We would especially like to thank Christopher J. Terman, Senior Lecturer, Dept. of EECS, MIT Computer Science and Artificial Intelligence Laboratory, for his help in adapting the Jade simulation tool to our course. The MIT License can be viewed [here](#).

We are extremely grateful to Qualcomm Technologies for generously providing technical information on their Snapdragon Processors and Krait CPU.

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Information, policies and schedule subject to change at the discretion of the instructor.

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