

[Courseware \(/courses/UTAustinX/UT.6.01x/1T2014/courseware\)](/courses/UTAustinX/UT.6.01x/1T2014/courseware)
[Course Info \(/courses/UTAustinX/UT.6.01x/1T2014/info\)](/courses/UTAustinX/UT.6.01x/1T2014/info)
[Discussion \(/courses/UTAustinX/UT.6.01x/1T2014/discussion/forum\)](/courses/UTAustinX/UT.6.01x/1T2014/discussion/forum)
[Progress \(/courses/UTAustinX/UT.6.01x/1T2014/progress\)](/courses/UTAustinX/UT.6.01x/1T2014/progress)
[Questions \(/courses/UTAustinX/UT.6.01x/1T2014/a3da417940af4ec49a9c02b3eae3460b/\)](/courses/UTAustinX/UT.6.01x/1T2014/a3da417940af4ec49a9c02b3eae3460b/)
[Syllabus \(/courses/UTAustinX/UT.6.01x/1T2014/a827a8b3cc204927b6efaa49580170d1/\)](/courses/UTAustinX/UT.6.01x/1T2014/a827a8b3cc204927b6efaa49580170d1/)

**Time** is a critical parameter in an embedded system. In this chapter, we will further develop SysTick as a means to control time in our embedded system. We will activate the **phase-lock-loop** (PLL) for two reasons. First, by selecting the bus frequency we can tradeoff power for speed. Second, by creating a bus clock based on an external **crystal**, system time will be very accurate. An effective development process will be to separate what the system does from how it works. This abstraction will be illustrated during the design of **finite state machines** (FSM). All embedded systems have inputs and outputs, but FSMs have states. We will embody knowledge, “what we know” or “where we’ve been”, by being in a state. A traffic light and vending machine will be implemented using FSMs. Finally, we will introduce **stepper motors** and show how to use a FSM to control the motors.

### Learning Objectives:

- Learn how to activate the PLL so the microcontroller has an accurate time base
- Use SysTick to produce accurate time delays
- Learn how to organize data on the computer using structures
- Develop a design strategy for building Finite State Machines
- Explain how stepper motors work using two motors to make an autonomous robot



[About \(https://www.edx.org/about-us\)](https://www.edx.org/about-us)
[Jobs \(https://www.edx.org/jobs\)](https://www.edx.org/jobs)  
[Press \(https://www.edx.org/press\)](https://www.edx.org/press)
[FAQ \(https://www.edx.org/student-faq\)](https://www.edx.org/student-faq)  
[Contact \(https://www.edx.org/contact\)](https://www.edx.org/contact)



EdX is a non-profit created by founding partners Harvard and MIT whose mission is to bring the best of higher education to students of all ages anywhere in the world, wherever there is Internet access. EdX's free online MOOCs are interactive and subjects include computer science, public health, and artificial intelligence.



(http://www.meetup.com/edX-Global-Community/)



(http://www.facebook.com/EdxOnline)



(https://twitter.com/edXOnline)



(https://plus.google.com/108235383044095082)



(http://youtube.com/user/edxonline)

© 2014 edX, some rights reserved.

[Terms of Service and Honor Code -](#)  
[Privacy Policy \(https://www.edx.org/edx-privacy-policy\)](https://www.edx.org/edx-privacy-policy)