

Why this course?

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TAB 1. Embedded system programming paradigms

	<ul style="list-style-type: none"> simple processors simple devices few operations 	
Bare metal ¹	<ul style="list-style-type: none"> you already know this devices with multitasking 	
	<ul style="list-style-type: none"> strict deadlines powerful processors complex devices very complex application 	
RTOS ²	<ul style="list-style-type: none"> file-systems, networking 	
	<ul style="list-style-type: none"> Pretty UI 	
Embedded Linux ³		

¹<https://www.embeddedrelated.com/thread/5762/rtos-vs-bare-metal>

²https://en.wikipedia.org/wiki/Real-time_operating_system

³https://en.wikipedia.org/wiki/Linux_on_embedded_systems

Why this course?

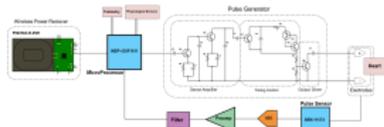
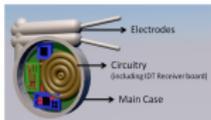
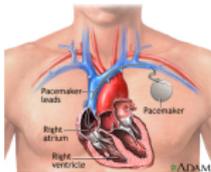


FIG 1. A pacemaker is a small, battery-operated device. This device senses when your heart is beating irregularly or too slowly. It sends a signal to your heart that makes your heart beat at the correct pace. In general, a heart pacemaker contains a small micro-controller and electrodes that connect the heart to the generator. The electrodes carry the electrical message to the heart. A defective pacemaker can cause more harm

Why this course?

- How can we prove that an unmanned aerial vehicle (UAV) will brake quickly enough if it encounters an object on its path?
- The possibility of life-or-death decisions being taken by an UAV not under the direct control of humans needs to be taken seriously
- In short, how do you know that a UAV military drone will work as expected?



FIG 2. General Atomics MQ-9 Reaper
The MQ-9 is the first hunter-killer UAV designed for long-endurance, high-altitude surveillance. It is capable of remotely controlled or autonomous flight operations and is primarily for the United States Air Force (USAF).

¹https://en.wikipedia.org/wiki/General_Atomics_MQ-9_Reaper

Why this course?

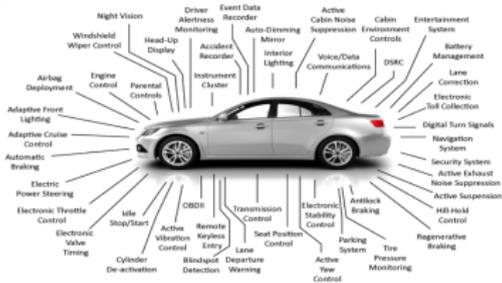


FIG 3. Embedded controllers found in a modern vehicle

Why this course?



FIG 4. Traffic lights—How do you guarantee that cars won't clash into each other?

- 1 Should we be worried that our cars are controlled by software?
- 2 How Software Is Eating the Car—The trend toward self-driving and electric vehicles will add hundreds of millions of lines of code to cars. Can the auto industry cope?

Why this course?

WIRELESS IMPLANTABLE MEDICAL DEVICES

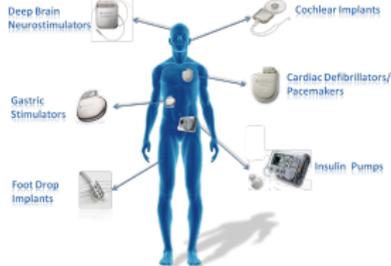


FIG 5. implantable medical devices—Fatal consequences if they fail to work as intended

Why this course?



FIG 6. Artist's conception of NASA's Mars Exploration Rover on Mars. Its mission almost failed due priority inversion.

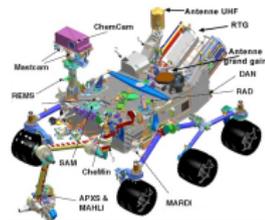


FIG 7. Instrumentation of the Mars Rover

Why this course?

- It's a fundamental course on embedded system⁴⁵
- In this course, we explore scheduling questions like these
- The course teaches provable guarantees of timing constraints for applications including autonomous vehicles.
- The course will explore timing constraints, both when programs have static priorities and when priorities can change over time.
- The course will also explore both theoretical and practical challenges introduced by modern embedded systems with multiple processors.
- **The course will be challenging**—but it will serve as a cornerstone for your future career in embedded systems.

⁴Please read this book for an extensive list of what you need to know as an embedded engineer Edwards, L. (2014). So You Wanna Be an Embedded Engineer: The Guide to Embedded Engineering, from Consultancy to the Corporate Ladder. Newnes.

⁵Steve Brown also gives succinct summary of what you need to know as an embedded engineer at this blog

<https://www.embeddedrelated.com/showarticle/1324.php>

The end