

Why this course?

Kizito NKURIKIYEZU, Ph.D.

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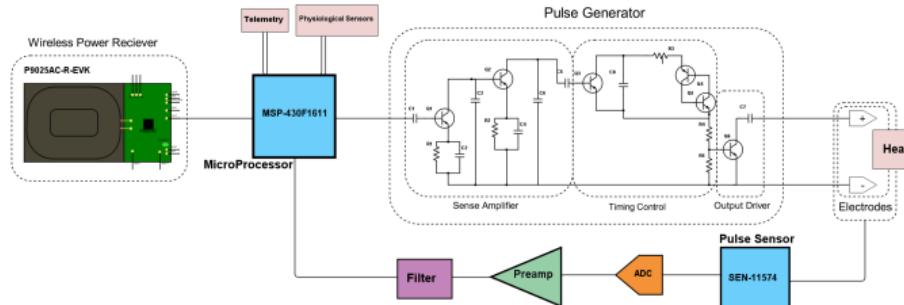
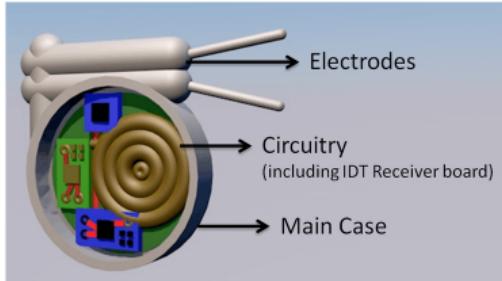
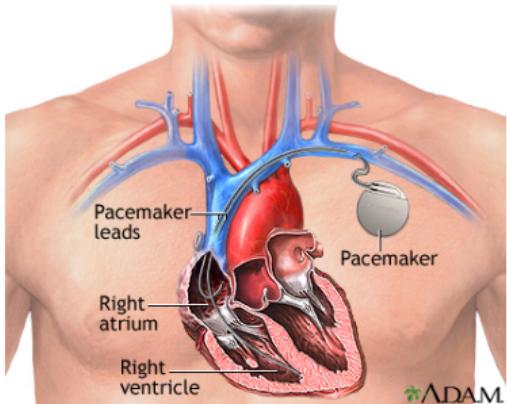


FIG 1. A pacemaker is a small, battery-operated device. This device senses when your heart is beating irregularly or too slowly. It sends a signal to your heart that makes your heart beat at the correct pace. In general, a hear pacemaker contains a small micro-controller and electrodes that connect the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

¹<https://www.paulsonandnace.com/defective-pacemaker-can-cause-harm-good/>

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

²What is the implication of drone warfare? The following link debates their ethical use

³Autonomous military drones: no longer science fiction. [What is the implication?](#)

⁴[Two challenges in embedded systems design](#)—predictability and robustness

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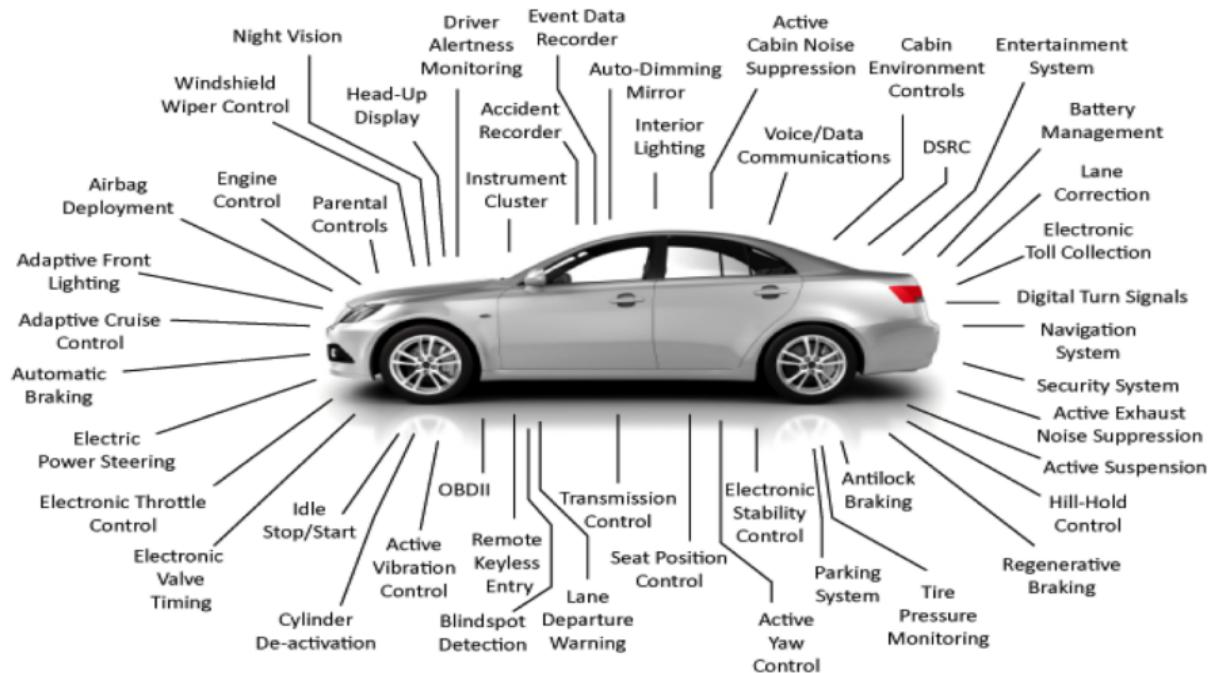


FIG 3. Embedded controllers found in a modern vehicle

¹Should we be worried that our cars are controlled by software?

²How Software Is Eating the Car—The trend toward self-driving and electric vehicles will add

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

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WIRELESS IMPLANTABLE MEDICAL DEVICES

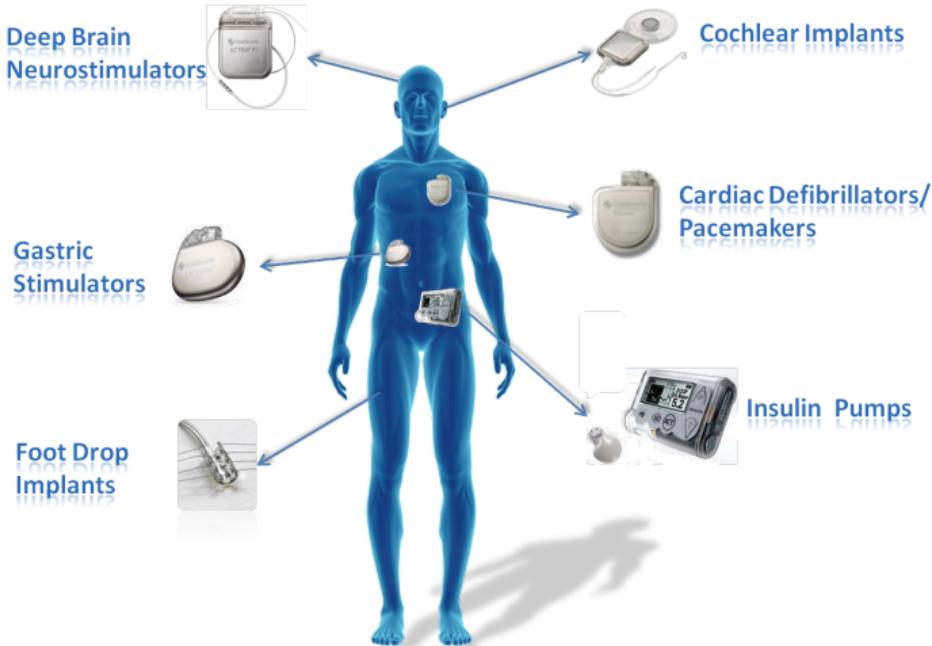


FIG 5. implantable medical devices—Fatal consequences if they fail to work as intended

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

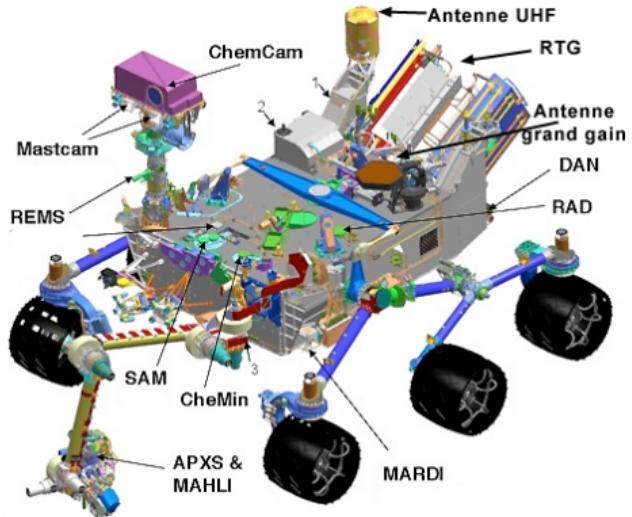


FIG 7. Instrumentation of the Mars Rover

²<http://www.cs.cornell.edu/courses/cs614/1999sp/papers/pathfinder.html>

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- It's a fundamental course on embedded system¹²
- 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.

¹Please 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.

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