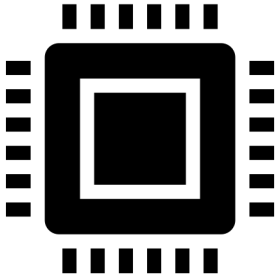
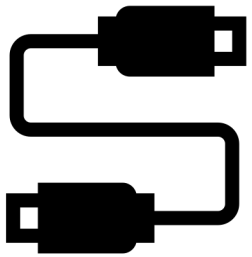
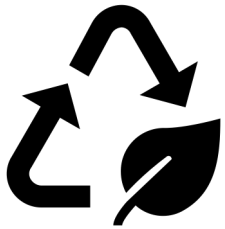




Class 2: Project for EECS 3215

Dr. James Andrew Smith

Winter 2020



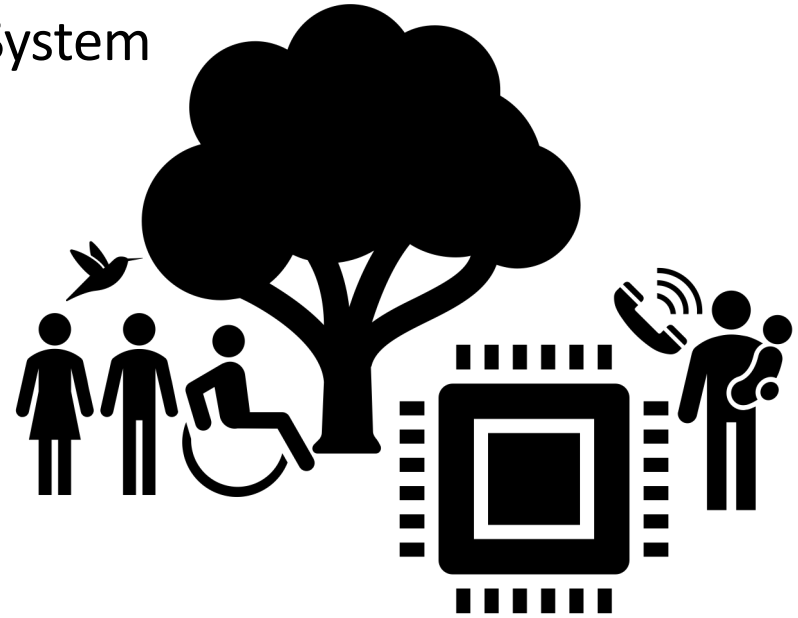





Icons: courtesy of Microsoft

The Project

- Solve a problem with an Embedded System
- Design and Implement the Solution
  - Use a microcontroller (LPC8xx) or FPGA
- Add to it
- Program it
- Test it
- Demonstrate it
- Initial idea after Reading Week
- Final submission on last day of semester (April 6)



Icons: courtesy of Microsoft

Milestones & Progress

- Plan your project
  - Best & Worst cases
  - Have contingency plan ready so you can fall back
- Part 1
  - Due after reading week
- Part 2
  - Due last day of class

Custom Hardware

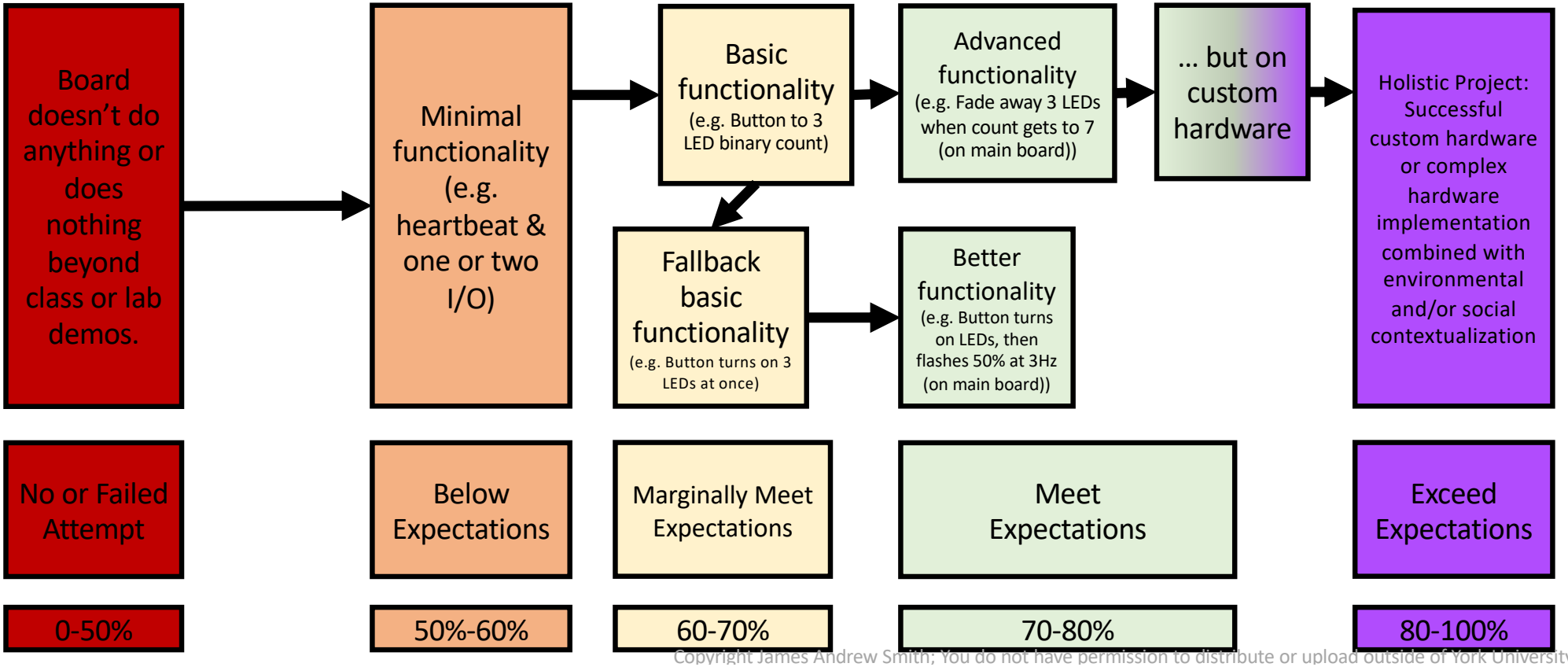
- Your experience level dictates complexity
  - 1st timer? Simple off-the-shelf, no soldering
  - Old hat? Solder the board or try complex COTS
- Combine off-the-shelf modules… for example
  - 1 or 2 Arduino Shields
  - 1 or 2 Mikroelectronika Click Boards
  - Multiple discrete chips & support hardware
    - RS485 chip + power supply + support components
- Integration
  - Breadboard is good
  - Soldering is better
- Packaging, Power & Display
  - Cardboard box is good
  - Wood, plastic or metal is better

How will you be assessed on the project?

Rubric Numeric Score	Rubric Description	York Description	York Letter Grade
4	Exceeding Expectations	Exceptional	A+
3.5		Excellent	A
3	Meeting Expectations	Very Good	B+
		Good	B
		Competent	C+
2.5		Fairly Competent	C
		Passing	D+
2	Marginally Meeting Expectations	Barely Passing	D
1.5		Marginally Failing	E
1	Below Expectations	Failing	F

Assessment is Rubric-based

Most students are expected to “meet expectations” (70-80% grade)



Rubric for Part 1: Abstract and Diagram

(after Reading Week)

CLO 3: **Design, implement and interface with standard and custom peripherals** (*GAI: Conceive design solutions to solve the defined problem*)

1. Does not design solutions to solve defined problem.
2. Designs incomplete solutions.
3. **Solutions complete, but lacking in elegance/innovation/creativity/professionalism.**
4. Conceives elegant/innovative/creative/professional standard solutions to solve the defined problem

Rubric Numeric Score	Rubric Description	York Description	York Letter Grade
4	Exceeding Expectations	Exceptional	A+
3.5		Excellent	A
3	Meeting Expectations	Very Good	B+
		Good	B
		Competent	C+
2.5		Fairly Competent	C
		Passing	D+
2	Marginally Meeting Expectations	Barely Passing	D
1.5		Marginally Failing	E
1	Below Expectations	Failing	F

Rubric for Part 2: Report & Video

(end of semester)

CLO 1: **Select and utilize appropriate parallel, serial and analog interfaces**

- (*GAI: Use specialized engineering knowledge of design specific components, systems or processes to solve engineering problems*)

1. Does not to use specialized knowledge needed to solve the engineering problem
2. Uses some specialized knowledge of design specific components, systems or processes to solve the engineering problem
3. **Uses appropriate/relevant specialized knowledge of design specific components, systems or processes resulting in a reasonable solution**
4. Sophisticated use of specialized engineering knowledge of design specific components, systems or processes to solve engineering problems

Rubric Numeric Score	Rubric Description	York Description	York Letter Grade
4	Exceeding Expectations	Exceptional	A+
3.5		Excellent	A
3	Meeting Expectations	Very Good	B+
		Good	B
		Competent	C+
2.5		Fairly Competent	C
		Passing	D+
2	Marginally Meeting Expectations	Barely Passing	D
1.5		Marginally Failing	E
1	Below Expectations	Failing	F

Rubric for Part 2: Report & Video

(end of semester)

CLO 2: **Design embedded software and hardware systems to address problems in important application domains under tight constraints**

- (GAI: Demonstrate skills in computer programming, data analysis and graphical visualization)

1. Does not demonstrate skills in computer programming, data analysis and graphical visualization
2. Demonstrates marginal skills in computer programming, data analysis or graphical visualization
3. **Demonstrates competency in computer programming, data analysis and graphical visualization**
4. Demonstrates superior skills in computer programming, data analysis and graphical visualization

Rubric Numeric Score	Rubric Description	York Description	York Letter Grade
4	Exceeding Expectations	Exceptional	A+
3.5		Excellent	A
3	Meeting Expectations	Very Good	B+
		Good	B
		Competent	C+
2.5		Fairly Competent	C
		Passing	D+
2	Marginally Meeting Expectations	Barely Passing	D
1.5		Marginally Failing	E
1	Below Expectations	Failing	F

Rubric for Part 2: Report & Video

(end of semester)

CLO 3: **Design, implement and interface with standard and custom peripherals**

- GAI: Conceive design solutions to solve the defined problem

1. Does not design solutions to solve defined problem.
2. Designs incomplete solutions.
3. **Solutions complete, but lacking in elegance/innovation/creativity/professionalism.**
4. Conceives elegant/innovative/creative/professional standard solutions to solve the defined problem

Rubric Numeric Score	Rubric Description	York Description	York Letter Grade
4	Exceeding Expectations	Exceptional	A+
3.5		Excellent	A
3	Meeting Expectations	Very Good	B+
		Good	B
		Competent	C+
2.5		Fairly Competent	C
		Passing	D+
2	Marginally Meeting Expectations	Barely Passing	D
1.5		Marginally Failing	E
1	Below Expectations	Failing	F

Rubric for Part 2: Report & Video

(end of semester)

CLO 4: **Prototype embedded systems using microcontrollers and field programmable gate arrays (FPGAs)**

- (ignore GAI 1; GAI 2: Decompose complex systems into smaller, more manageable sub-systems.

1. Does not decompose complex systems into smaller, more manageable sub-systems; or proposed sub-systems are incomplete or illogical
2. Able to decompose complex systems into smaller, more manageable sub-systems but missing one or two sub-systems (incomplete)
3. **Able to decompose complex systems into smaller, more manageable but suboptimal sub-systems**
4. Able to decomposes complex systems into an optimal set of smaller more manageable sub-systems

Rubric Numeric Score	Rubric Description	York Description	York Letter Grade
4	Exceeding Expectations	Exceptional	A+
3.5		Excellent	A
3	Meeting Expectations	Very Good	B+
		Good	B
		Competent	C+
2.5		Fairly Competent	C
		Passing	D+
2	Marginally Meeting Expectations	Barely Passing	D
1.5		Marginally Failing	E
1	Below Expectations	Failing	F

Below and Marginal Expectations

- Don’t leave it to the last week
  - First timers beware!
  - Each lab is a component you can use
  - Practice! Don’t let your partner do everything
    - “I like how you did that. Now let me try.” (*elbow*)
- Start with low-hanging fruit
  - Early
  - Verify
  - Document
  - Backup (2 boards?)

Exceeding Expectations

- Go beyond an excellent technical widget.
- Context and Impact of your widget
  - Social
  - Political
  - Environmental
- Researched
  - Citations to existing technologies, issues
  - Mix ”popular” & “academic” sources (scholar.google.com; library.yorku.ca)
- Alternative
  - Excellent Technical Widget
  - Wikipedia entry in Embedded domain
    - Translation
    - Person profile (new; non-traditional)
    - Technical entry that addresses equity, diversity, inclusion issue