

# ME4182 / GT4823

You are part of an experiment to create the most high-profile, rewarding, expensive, hard-working course at Georgia Tech and a model for mechanical design education at engineering schools worldwide

<http://mecapstone.gatech.edu/>

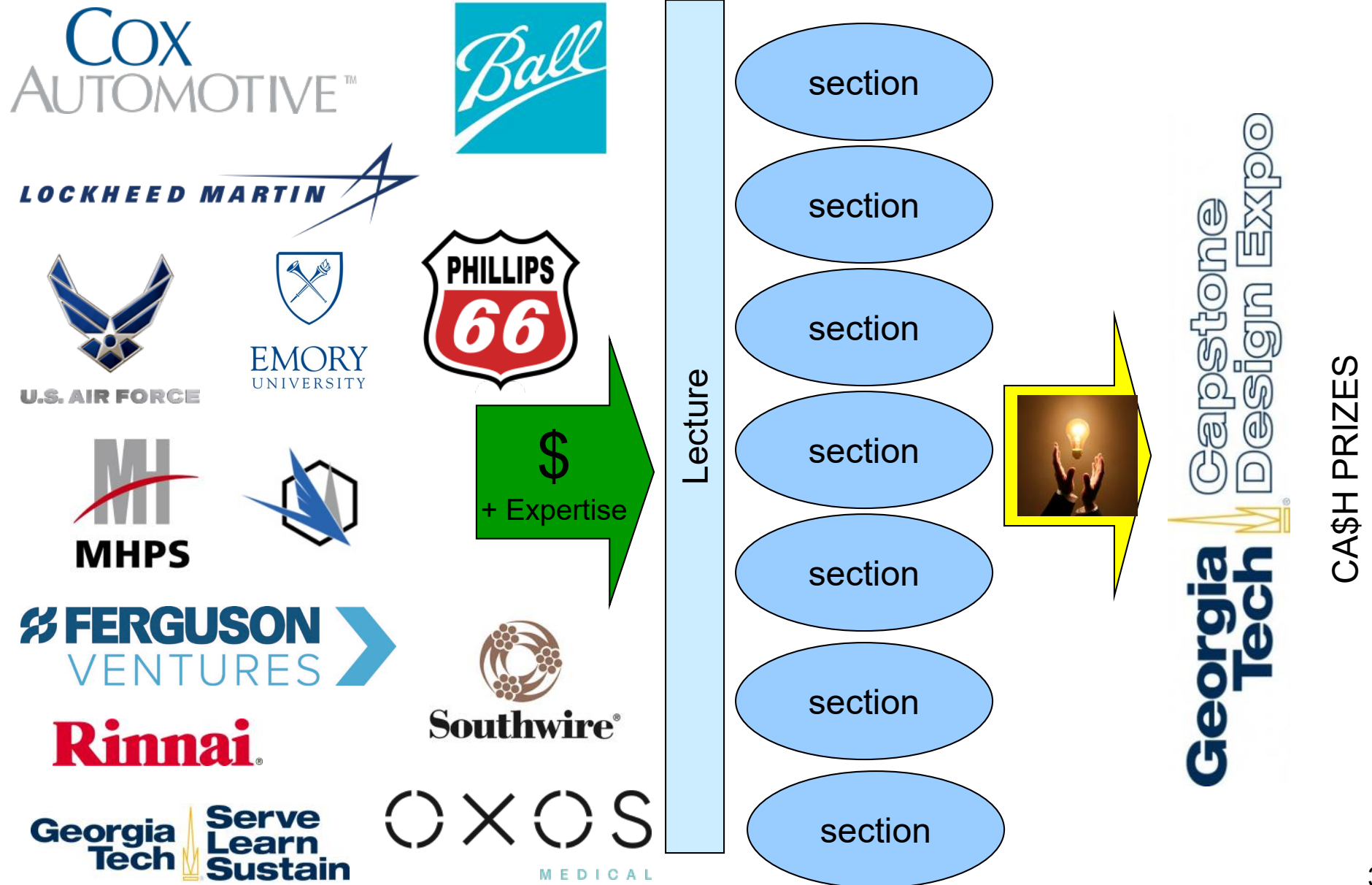
[All-Sections Intro](#)

[Individual Studio Section Intro](#)

# All-Sections Introduction

- Yes, there's redundancy w/the Studio-Section intro...

# Big picture of ME4182 & GT4823



# What is ME 4182 and GT 4823 all about?

## Goals for the course:

**1. Identify an unmet need**

**WHAT'S THE PROBLEM?**

**2. Invent/design something useful**

**CREATIVITY, INNOVATION**

**3. Apply your analytical knowledge to design it**

**ANALYTICAL SKILLS**

**4. Prove it will work (Simulate it, build it, test it, virtually, physically)**

**MODELING AND HANDS-ON**

**5. Document everything (design notebooks, reports, presentations)**

**6. Demonstrate it at the Expo**

**7. Give to sponsor for use or patent it and start company**

# Projects types

- Industrial (big and small)
  - Bid for the projects on <http://projects.gatech.edu/>
- Faculty Research Lab
  - Bid for the projects on <http://projects.gatech.edu/>
- Serve-Learn-Sustain sponsored projects
  - <https://serve-learn-sustain.gatech.edu/capstone-projects>
- Your own idea!
  - No need to bid, but you need approval from your section instructor. Consider registering for ME4182-X section

# CREATE-X Capstone – ME 4182X

Giving you the confidence to pursue your own ideas

ME, ECE, and CS student teams will design and build prototypes of their invention ideas and explore whether there is a market demand and value proposition for them.

Startups that have gone through CREATE-X have created dozens of new jobs, generated tens of millions of dollars in revenue, secured institutional financing, run successful crowdfunding campaign, and serve hundreds of thousands of consumers.



Enroll in ME 4182-X  
See Prof. Forest  
[cforest@gatech.edu](mailto:cforest@gatech.edu)



# How to form a team?

- Team sizes are 4-6 students per team
- Section swaps possible within the following sections ([FAQ](#))
  - ME4182 and GT4823 - All sections (TTr 8-1045 AM studios)
- Find team members
  - Based on project interest on [projects.gatech.edu](http://projects.gatech.edu)
  - Based on skills and experience on [projects.gatech.edu](http://projects.gatech.edu)
  - Self-identified/assembled

# ANNOUNCEMENTS

- Social “Mixer” with sponsors today (1/6/20) between 3-4pm in CULC 152
- For GT4823-MEA, MEB, ECE and MSE
  - Tomorrow’s studio (1/7) will begin at 8am in **GTMI/MaRC Building Auditorium**
  - Thursday’s studio (1/9) will begin at 8am in **GTMI/MaRC Building Auditorium** (and attended by GT4823-BME students).



# How are teams matched to projects?

- Two avenues
  - Bid for a sponsored project
  - Propose your own
- Teams are matched to projects and to faculty (see the FAQ [here](#))
- Even if you plan on bidding for sponsored projects, should have a “Plan B (C, and D)” project idea of your own

# What is a Good Bid?

Basically, **convince us that you are the best group for the project.**

Tell us:

- What is your understanding of the project?
- Why do you want the project?
- What are your skills, talents, experiences relevant to the project?
- Anything else that is relevant

# Elements of a Good Student Project

- What's the problem?
  - NOT “We’re going to design a better mousetrap”
- Creative/Innovative - not just an assembly of off-the-shelf parts (room for novelty)
- Lends itself to analysis
- Sufficient scope for senior design
- Team should have or acquire the skills to complete the project.
- Produce a proof-of-concept and learn from it
  - Design revisions
  - Validate design decisions

# Due Dates (NOW!)

- Saturday, 1/11, 08:00 pm – deadline for submitting bids for sponsored projects on [projects.gatech.edu](http://projects.gatech.edu)
- For your own idea:
  - Get approval from instructor;
  - Register your team on [projects.gatech.edu](http://projects.gatech.edu)
- **Make sure all team members are listed in your team on [projects.gatech.edu](http://projects.gatech.edu)**

<http://mecapstone.gatech.edu/>

(grading, schedule, report guidance...)

# Section Introduction

- Yes, there's redundancy w/the All-sections intro...

# Main Lecture Topics

1. Course Overview, Projects, Teams and Bids, Communication
2. User needs / Engineering Design Specifications
3. Industrial Design & Human Factors
4. Ideation, Concept Generation, Design Process
5. Market research and Prior Art
6. Risk, Liability, Codes & Standards
7. Analysis
8. Social, environmental, sustainability considerations
9. Mockups and prototypes; why and when
10. Intellectual Property Protection, Filing Patent Claims
11. Forming a company
12. New lectures on communication to non-technical audiences

# Timeline



Choose a team  
Choose a topic  
Understand the problem  
Market research  
Patent study  
Design concepts

Choose Design  
Physical Mockup  
Analyses  
Calculations  
Drawings

Design validation  
Prototyping  
Testing  
CAD  
FEA  
Manufacturing



# What is ME 4182 and GT 4823 all about?

## Application of the design process:

1. To solve an engineering *problem*...
2. Which includes interdisciplinary parameters...
  - i. Materials, controls, fluids, structures, heat transfer, ....
  - ii. Human factors, engineering economy, safety, etc.
3. In a team structure...
4. To design a *solution*...
  - i. A mechanical device
  - ii. A machine
  - iii. A system
  - iv. An app,
5. That performs the functions established by a project description derived from the *problem*.

Each team produces detailed drawings, detailed specifications, presentations, and a proof-of-concept (virtual or real) of the proposed design *solution*.

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**MODELING AND HANDS-ON**

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**7. Give to sponsor for use or patent it and start company**

# But what's the problem?

- Your own..
- ..or sponsored...
  - [projects.gatech.edu/projects](https://projects.gatech.edu/projects)

# Project overview

A variety of projects for teams of 4-6 people:

- Industrial (big and small)
- Research lab
- Developing country/sustainability
- NAE Grand [Challenges](#)
- Your own idea!
- Sponsored [projects.gatech.edu/projects](https://projects.gatech.edu/projects)

# How are teams matched to projects?

- Form a team!!!! (by EOB Th of this week!)
- Two avenues
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  - Propose your own
- Teams are matched to projects and to faculty (see the FAQ [here](#))
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6. Produce a proof-of-concept and learn from it
  - Design revisions
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# Section meetings

- ~ 30 min/wk with your team and your instructor, up to almost an hour late in the semester
- Section instructor provides weekly mentorship, receives deliverables, assigns grades, etc.



# Lectures & Studios for GT4823

- **Lectures:**
  - All BMEs attend BME 4602 lectures
  - All other ECEs, MEs and MSEs should attend lectures offered by the team's majority school
- **Studios (from week #2):**
  - All BME majority teams attend studios on Thursday 8:00-10:45am in U A Whitaker Biomed Engg 0209A
  - All ECE majority teams typically meet with their ECE primary advisor during T/Th 8-10:45am
  - All ME heavy teams with ECEs and MSEs typically meet with Dr. Jariwala during T/Th 8-10:45am
  - All ME heavy teams with BMEs typically meet with their Drs. Young and Sawicki during T/Th 8-10:45am

Design your *product*...

... not your *prototype*

Build (prototype) for a  
*purpose*, and to a *plan*

# Spring 2020 ME Capstone Instructors



Ken Cunefare



Amit Jariwala



Todd Sulchek



Greg Sawicki



Aaron Young



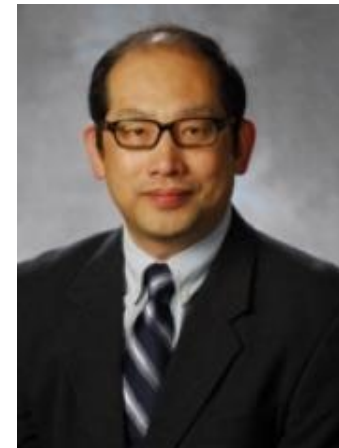
Bert Bras



Richard Cowan



Peter Hesketh



Roger Jiao



David MacNair

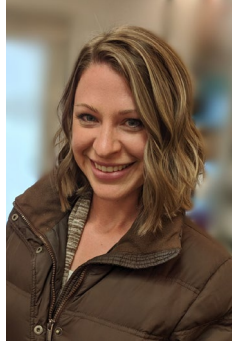
# Role of the Capstone Advisors

- Advise the design process
  - Map the expectations & outcomes to each unique project
  - Ask good questions
  - To require alternatives and implications
  - To require analysis
  - To be a resource
  - Challenge you
- Sponsor scoping, advice, expectation management
- **Not** designers; **not** decision makers
  - Help guide you to answer the questions yourselves
- Subject matter experts
  - But you're to try to answer/solve the problem first!

# Super Support Staff



Anuja Kandare  
(TA)



Kinsey Herrin  
(Special Consultant)



Luci Erisman  
(Reimbursements)



Nichelle  
Compton  
(Expo)

## 3D Printing



Clint Rinehart

## Machining



Steven Sheffield

# Special Meeting Space

- MRDC #4401 available to reserve for Capstone Design teams for team meetings and calls with sponsors
- Students can reserve times up to 2 weeks in advance using the link below:
- <https://calendly.com/jlinsey>

# GT Fab Facilities: Montgomery Machining Mall

[www.me.gatech.edu/facilities/machine\\_shop](http://www.me.gatech.edu/facilities/machine_shop)



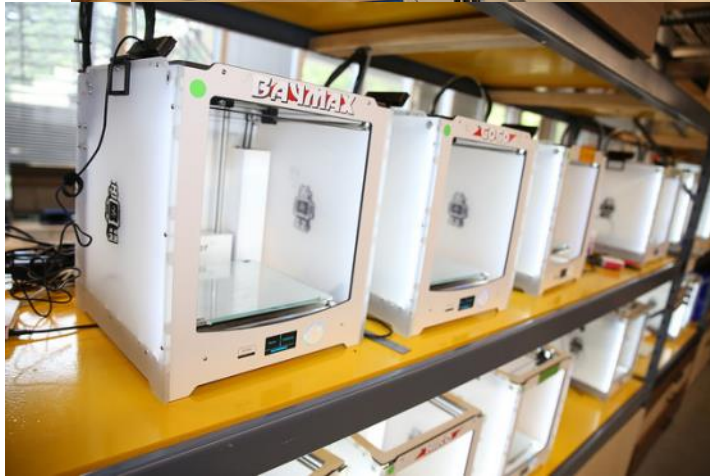
- Hours are Monday through Friday
- 6:30 am – 4:30 pm
- Training opportunities start with the survey [here](#).

20<sup>th</sup> century tools: CNC mills, lathes, EDM, presses, ...

19<sup>th</sup> century tools/Dirty: TIG/MIG welding, grinding, saws...

21<sup>st</sup> century tools: Zeiss CT scanner...

# GT Fabrication Facilities: Invention Studio



**2<sup>nd</sup> Floor MRDC**

**Staff Contact: Luci Erisman**

**lucinda.erisman@me.gatech.edu**

- Circuit Lounge
- 3D Print Farm
- Water Jet
- Laser Cutters
- Metal working
- Wood shop

Microcontrollers; National Instruments DAQ Boards; Paint Booth; Vinyl Cutting; Urethane Casting and Molding; Vacuum Forming; Injection Molding; 3D Scanning; Spot Welding...

***Become a PI!!***



# GT Fabrication Facilities: The Hive Interdisciplinary Design Commons



# Electronics Fabrication/Testing

[www.me.gatech.edu/facilities/electronic\\_lab](http://www.me.gatech.edu/facilities/electronic_lab)

## ME Electronics Lab

2<sup>nd</sup> floor MRDC, next to IDEA Lab

## ECE Senior Design Lab Van Leer



Andrew Keller

Kyle French  
Electrical Engineer  
[kyle.french@me.gatech.edu](mailto:kyle.french@me.gatech.edu)

Amy Wang



Staff Contact: James Steinberg  
[james.steinberg@ece.gatech.edu](mailto:james.steinberg@ece.gatech.edu)

**Georgia  
Tech**



**Capstone  
Design Expo**



**Tuesday April 21  
4-8pm McCamish Pavilion**

THE  
**inVENTURE**™  
PRIZE  
@ GEORGIA TECH  
[Inventureprize.gatech.edu](http://Inventureprize.gatech.edu)

Golden Tickets!  
(Fall Expos)

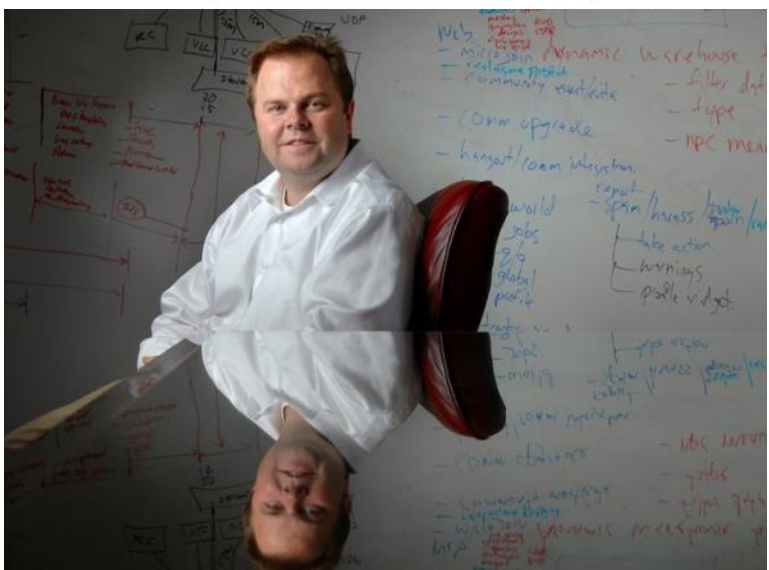
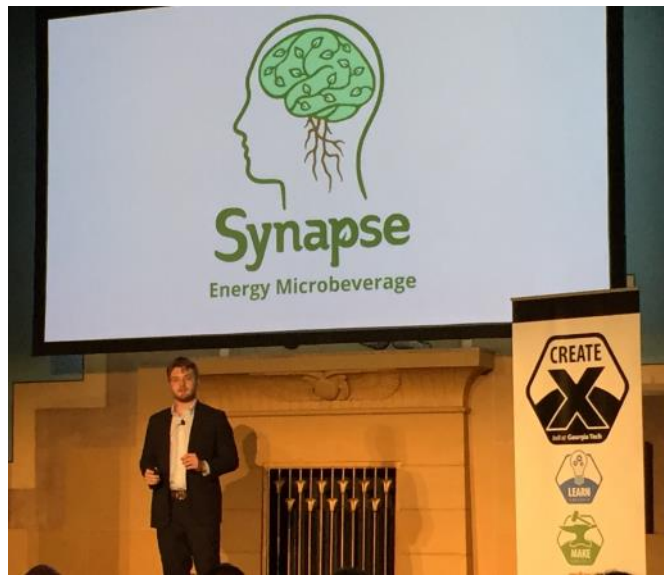
***Kickoff Session: 9/11/19  
Missed that one***

***Registration deadline: 1/13/2020***



# Startup Launch – Create X

More information [HERE](#)



# Space issues...

- NO separate studio space for 4182
- NO separate storage space for 4182
  - But some large projects *may* get access to space in IDEA Lab after 2110 ends
  - Watch for updates
- Be flexible, be patient, be creative...

# Due Dates (NOW!)

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(grading, schedule, report guidance...)

# Backup...

FAQ #1: Are students allowed to move groups even if they don't register for the same section?

- Yes, within certain constraints. First, it is preferred that all prospective team members register in the same section if possible. Students may be moved between sections if they are registered in sections that meet at the same time. However, if the move would yield too many teams or students for a given faculty member, the move may not be allowed.

# FAQ #2: What projects are acceptable to which faculty?

- If students have a specific project in mind, can reach out to the primary section instructor to confirm if the instructor will accept their project.
- Before the start of any given semester, faculty are polled to determine which of the sponsored projects are acceptable for their sections. This information is used to match faculty-to-projects-to-teams as part of the bidding process.

# Expo Judging

We tell the judges their scope is to assess...

1. Creativity
2. Utility
3. Quality of analysis
4. Proof of function
5. Presentation

# Expo Judging

## 1. Creativity

5 – Original, non-obvious solution/recommendation

3 – Reapplication or recombination of existing solution

1 – Unsurprising/obvious solution

# Expo Judging

## 2. Utility

5 – Solution has large impact on the design challenge

3 – Solution has moderate impact on the design challenge

1 – Solution has minimal impact on the design challenge

# Expo Judging

## 3. Quality of analysis

***Analysis is typically conducted to scope the problem and/or test a hypothesis***

- 5 – Demonstrated an insightful analysis that accurately applies relevant models and methods
- 3 – Demonstration of basic analysis
- 1 – Insufficient analysis



# Expo Judging

## 4. Proof of function

### ***Would the solution work?***

5 – Successfully validated all critical aspects of the designed solution (through physical prototype and/or simulation)

3 – Validated few aspects of the solution

1 – Conducted insufficient validation for the solution/recommendation

# Expo Judging

## 5. Presentation

***Did the team adapt their presentation to your level of understanding?***

5 – Produced a clear and comprehensive presentation (oral and/or visual)

3 – Produced presentation with average clarity

1 – Unclear about what the project is or meant to do.