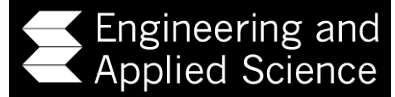




# CS/EE/ME 75 – FSAE Electric

## 5 October 2015



Guillaume Blanquart   Azita Emami   Richard Murray  
Joseph Bowkett   Cibeles Halasz   Noah Olsman   Shenghan Yao

Engineering and Applied Science  
California Institute of Technology

# Meeting Goals and Agenda

## Goals

- Review the SAE deliverables: what are they, when are they due
- Describe the use of GOTChA charts as a project planning tools
- Describe the engineering team GOTChA chart for fall
- Kick off the division activities for the term (via breakouts)

## Agenda

- 8:00 Goals, Agenda, Notetaker
- 8:05 Review of engineering team organizational structure & roles
- 8:10 2015 Formula SAE Electric schedule (Rob and Jake)
- 8:20 Engineering team goals, objectives, technical challenges & approach/milestones
- 8:40 Plan for the week
- 8:45 Division breakouts
- 9:00 Adjourn

**Notetaker:** \_\_\_\_\_

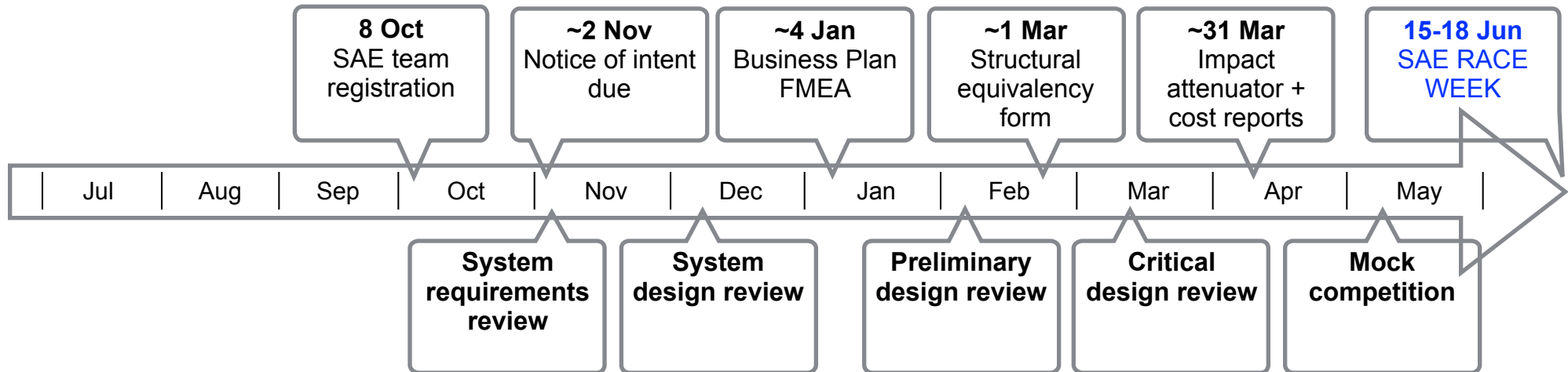
- Record notes and action items from meeting; post on wiki

# CS/EE/ME 75 Organization

<b>Integrated Product Team (IPT)</b> Project lead engineer: Rob Anderson    Technical lead engineer: Jake Harmon			
<b>Mechanical</b> Instr: G. Blanquart TA: Joseph Bowkett UG lead: Evan Sloan	<b>Energetics</b> Instr: A. Emami TA: Cibele Halasz UG lead: Santiago N	<b>Operations</b> Instr: R. Murray TA: Noah Olsman UG lead: Anup Kishore	<b>Support</b> Instr: Fromer TA: Shenghan Yao UG lead: Mark Lorden
<ul style="list-style-type: none"> <li>• 15-25 Caltech ug</li> <li>• 2-4 advisors</li> <li>• Chassis</li> <li>• Body shell</li> <li>• Drivetrain</li> <li>• Driver interface</li> </ul>	<ul style="list-style-type: none"> <li>• 10-15 Caltech ug</li> <li>• 2-4 advisors</li> <li>• Power</li> <li>• Hardware</li> <li>• Firmware</li> <li>• Software</li> </ul>	<ul style="list-style-type: none"> <li>• 10-15 Caltech ug</li> <li>• 2-4 advisors</li> <li>• Systems modeling</li> <li>• Safety procedures</li> <li>• Test procedures</li> <li>• Computing systems/data analytics</li> </ul>	<ul style="list-style-type: none"> <li>• 25-35 Caltech ug</li> <li>• 2-4 advisors</li> <li>• Fund raising</li> <li>• Communications</li> <li>• Facilities/equipment</li> <li>• Outreach/events</li> </ul>

- Team meetings (45-60 min/week): Mondays, 8 pm, 135 Gates-Thomas
- Division meetings:
  - Mechanical: Mon, 9-9:30 pm, 135 Gates-Thomas
  - Energetics: Mon, 9-9:30 pm, 115 Gates-Thomas
  - Operations: Fri, 12-12:30 pm, location TBD
  - Support: Mon, 9:30-10 pm, 135 Gates-Thomas

# Project/Course Timeline [Rob/Jake]



## SAE team registration

- What is this and who is responsible

## SAE notice of intent

- What is this and who is responsible

## Business plan

- Include enough detail for groups to understand first term deliverables

## FMEA

- Include enough detail for groups to understand first term deliverables

## Structural equivalency form

- What is this and who is responsible
- OK to leave out details for now

## Impact attenuator report

- What is this and who is responsible
- OK to leave out details for now

## Cost report

- What is this and who is responsible
- OK to leave out details for now

# GOTChA Charts

## Goals (1-3)

- Describe the goals of your project, in plain English
- Description should be understandable to your engineering friends (avoid jargon)
- Tie to the overall project goal

## Objectives (3-6)

- Specific tasks that you need to complete in order to accomplish your goals
- Objectives should be “SMART”
  - Specific - concrete descriptions
  - Measurable - can tell whether you accomplished them or not
  - Attainable - possible to complete in time available
  - Relevant - lined up w/ system spec
  - Trackable - possible to monitor progress as you go
- Guide: try to include numbers and dates, when possible

## Technical Challenges (4-8)

- List of problems that you expect to face in accomplishing your objectives
- Try to list anything that you are not sure about
- OK to include things that you don't yet know (eg, programming in C/C++, implementing a vision algorithm, etc)

## Approach (4-8)

- Describe how you are going to tackle the technical challenges that will let you accomplish your objectives to satisfy your goals
- Make sure all of the technical challenges are addressed (otherwise how will you overcome them?)
- Can serve as a work plan for the term - what do you want to do first, next, etc

# Engineering Principles and Fall 2015 Goals

## Project mission

- Gain hands-on engineering experience by designing and building energy efficient race vehicles
- Apply engineering concepts & better understand the mechanical, electrical and controls aspects of EV technology
- Develop innovative engineering solutions
- Assess costs and benefits to different power systems for vehicles
- Compete in and win SAE Formula Electric competition
- Engage the community

## Engineering Team Principles

- Safety is our main priority. If you don't know how to do something, find someone who does to help/teach you.
- Communication is key to our success.
- Nothing is impossible.

# 2015 Project GOTChA (1 of 2)

## Fall 2015 Goals

- Build a highly effective team with the skills and insights required to build an electric vehicle from scratch
- Complete a design that is compliant with the rules and will win the Formula SAE Electric competition

## Objectives

- Monitor system-level requirements and budget allocations for weight and cost of components as design is evolving
- Create compliant designs for all components and review design choices by the end of the term
  - Midterms: clearly defined requirements for each component (performance, cost, weight)

- Finals: compliant design, with evidence of viability (prototype, vendor quote, etc)
- Train all CS/EE/ME 75 students in safety procedures and create protocols required for safe testing, operations
- Make enough progress in first term to build complete vehicle by end of second term
  - Finalize and build plan for the vehicle frame and begin construction (mechanical)
  - Complete a validated energetics design that will pass technical inspection (energetics)
- Create infrastructure required for divisions to optimize their designs with testing and simulation (operations)

# 2015 Project GOTChA (2 of 2)

## Technical Challenges

- Very short timeline to produce working design, with minimal FSAE experience
- Lack of expertise in assembling and welding frame (design bottleneck)
- Meeting technical inspection requirements (competition bottleneck)
- Lack of expertise in high voltage electronics (design bottleneck, safety issue)

## Approach

- Have working core equipment (eg, motors, battery pack) working to allow testing as soon as the students are ready
- Create simulation and testing environments that will allow design space exploration of mechanical and energetic systems
- Know the Formula SAE Electric rules by heart



# Plan for the Week: 5-11 Oct 2015

## CS/EE/ME 75

- Complete HW #1 if you haven't already (eg, late adds)
- Division breakouts (introductions, plans for the week)
  - Mechanics: 135 Gates-Thomas (weekly division meeting @ 9)
  - Energetics: 115 Gates-Thomas (weekly division meeting @ 9)
  - Operations: 235 Gates-Thomas (quick meeting, then go to appropriate division)
  - Support - no breakout session
- HW #2 out tonight, due 11 Oct (Sun), 8 pm: GOTChA charts +

## Project activities (Rob)