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 Section Intro
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/](http://projects.gatech.edu/)

• Faculty Research Lab
  – Bid for the projects on [http://projects.gatech.edu/](http://projects.gatech.edu/)

• Serve-Learn-Sustain sponsored projects
  – [https://serve-learn-sustain.gatech.edu/capstone-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. Sulchek after class
todd.sulchek@me.gatech.edu
How to form a team?

• Team sizes are 4-6 students per team
• Section swaps possible within the following sections (FAQ)
  – ME4182-A, C, E, G and GT4823-ECE, MEB, MSE (MW 3-5:45pm studio times)
  – ME4182-B, D, F, and GT4823-MEA (TR 12-2:45pm studio times)
• Find team members
  – Based on project interest on projects.gatech.edu
  – Based on skills and experience on projects.gatech.edu
  – Self-identified/assembled
• Social “Mixer” with sponsors today (8/19) between 3-4pm in IC #215

• For ME4182-A, C, GT4823-MEB, ECE and MSE
  – Today’s studio (8/19) will begin at 4pm in IC #103
  – Wednesday’s studio (8/21) will begin at 3pm in Howey Physics L2
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, 8/24, 08:00 pm** – deadline for submitting bids for sponsored projects on projects.gatech.edu

- For your own idea:
  - Get approval from instructor;
  - Register your team on projects.gatech.edu

- Make sure all team members are listed in your team on 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
11. Forming a company
12. New lectures on communication to non-technical audiences

Associated deliverables and reports are due in your section meeting during the semester.
Timeline

Fall/Spring Semesters [16 wks]

1. Project Assignment
2. Choose a team
3. Choose a topic
4. Understand the problem
5. Market research
6. Patent study
7. Design concepts
8. First Report
9. Choose Design
10. Physical Mockup
11. Analyses
12. Calculations
13. Drawings
15. Design validation
16. Prototyping
17. Testing
18. CAD
19. FEA
20. Manufacturing
21. Final Report
22. Final presentation
23. Final report
24. Expo
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 ECEs who have taken ECE4011 attend ECE 4012 lectures
  – All other ECEs, MEs and MSEs should attend lectures on MW 1:55-2:45 pm in IC #103

• Studios (from week #2):
  – All BMEs heavy teams attend studios on R 12:00-2:45pm in MoSE 1201A
  – All ECEs heavy teams typically meet with their primary section instructors on MW 3-5:45pm
  – All ME heavy teams with ECEs and MSEs typically meet with their primary instructor during MW 3-5:45pm
  – All ME heavy teams with BMEs typically meet with their primary instructor during TR 12:00-2:45pm
Design your *product*...

... not your *prototype*
Fall 2019 ME Capstone Instructors

Ken Cunefare  Amit Jariwala  Todd Sulchek  Greg Sawicki

Bert Bras  Yan Wang  Roger Jiao
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

Timothy Sawchuk (TA)

Luci Erisman (Reimbursements)

Nichelle Compton (Expo)

3D Printing

Clint Rinehart

Machining

Steven Sheffield
GT Fab Facilities: Montgomery Machining Mall

www.me.gatech.edu/facilities/machine_shop

• Hours are Monday through Friday
• 7 am - 5 pm MF

• Training opportunities start with the survey here.

20th: CNC mills, lathes, EDM, presses, …
19th/Dirty: TIG/MIG welding, grinding, saws…
21st: Zeiss CT scanner…
GT Fabrication Facilities: **Invention Studio**

- 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…

**2nd Floor MRDC**

Staff Contact: Luci Erisman

lucinda.erisman@me.gatech.edu

*Become a PI!!*
GT Fabrication Facilities: The Hive
Interdisciplinary Design Commons
Electronics Fabrication/Testing

www.me.gatech.edu/facilities/electronic_lab

ME Electronics Lab
2nd floor MRDC, next to IDEA Lab

ECE Senior Design Lab
Van Leer

Andrew Keller
Kyle French
Electrical Engineer
kyle.french@me.gatech.edu
Amy Wang

Staff Contact: James Steinberg
james.steinberg@ece.gatech.edu
Monday December 2
4-8pm  McCamish Pavilion
THE
InVEntURE TM
PRIZE
@ GEORGIA TECH

Golden Tickets!
(Fall Expos)

Kickoff Session: 9/11/19
Registration opens: 2/2/20

Inventureprize.gatech.edu
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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- Make sure all team members are listed in your team on projects.gatech.edu
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 – Reaplication or recombination of exiting 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
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.