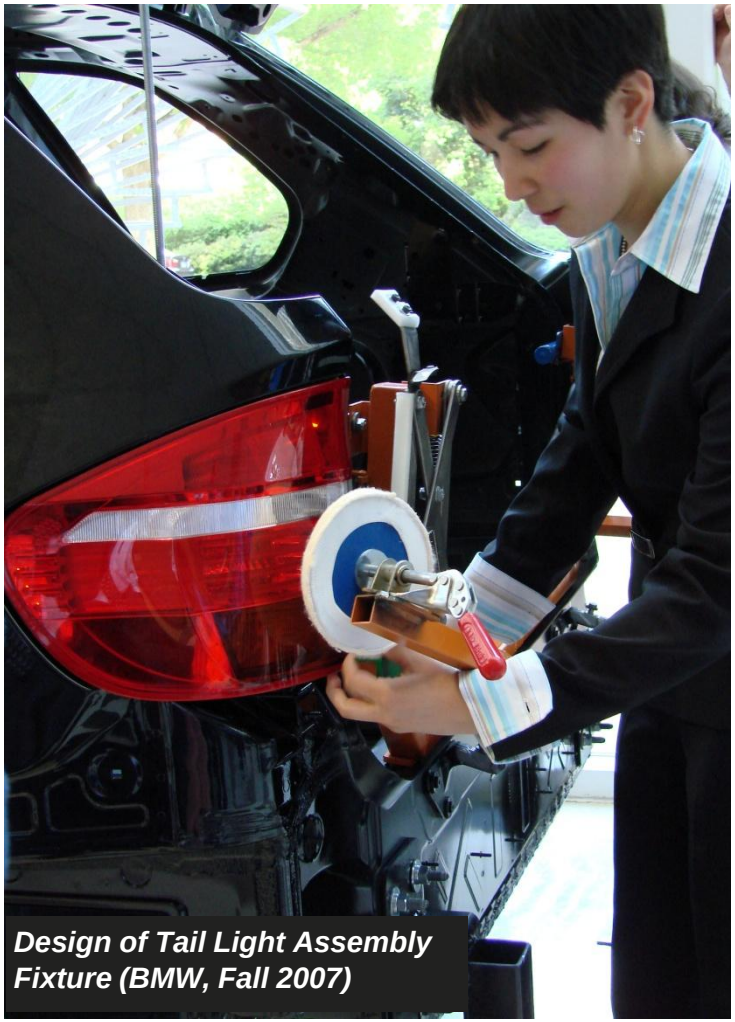
ME 402 – Senior Design

- Clemson University's Mechanical Engineering Capstone Program
  - Over three decades of supporting SC industry with student projects
  - Roughly 60 personweeks dedicated to each project (four teams of four students for 15 weeks at 10 hours/week)
  - Multiple solutions provided
  - Close interaction with industry to develop professional and refine engineering skills
  - International recognition
    - 2006-2008 International Capstone Design Fair in South Korea



Design of Tail Light Assembly Fixture (BMW, Fall 2007)

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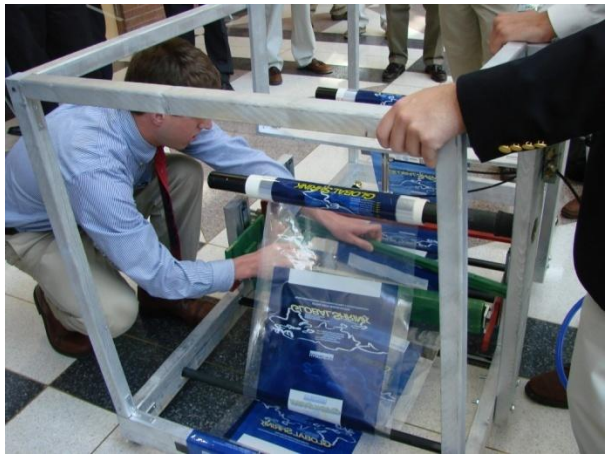
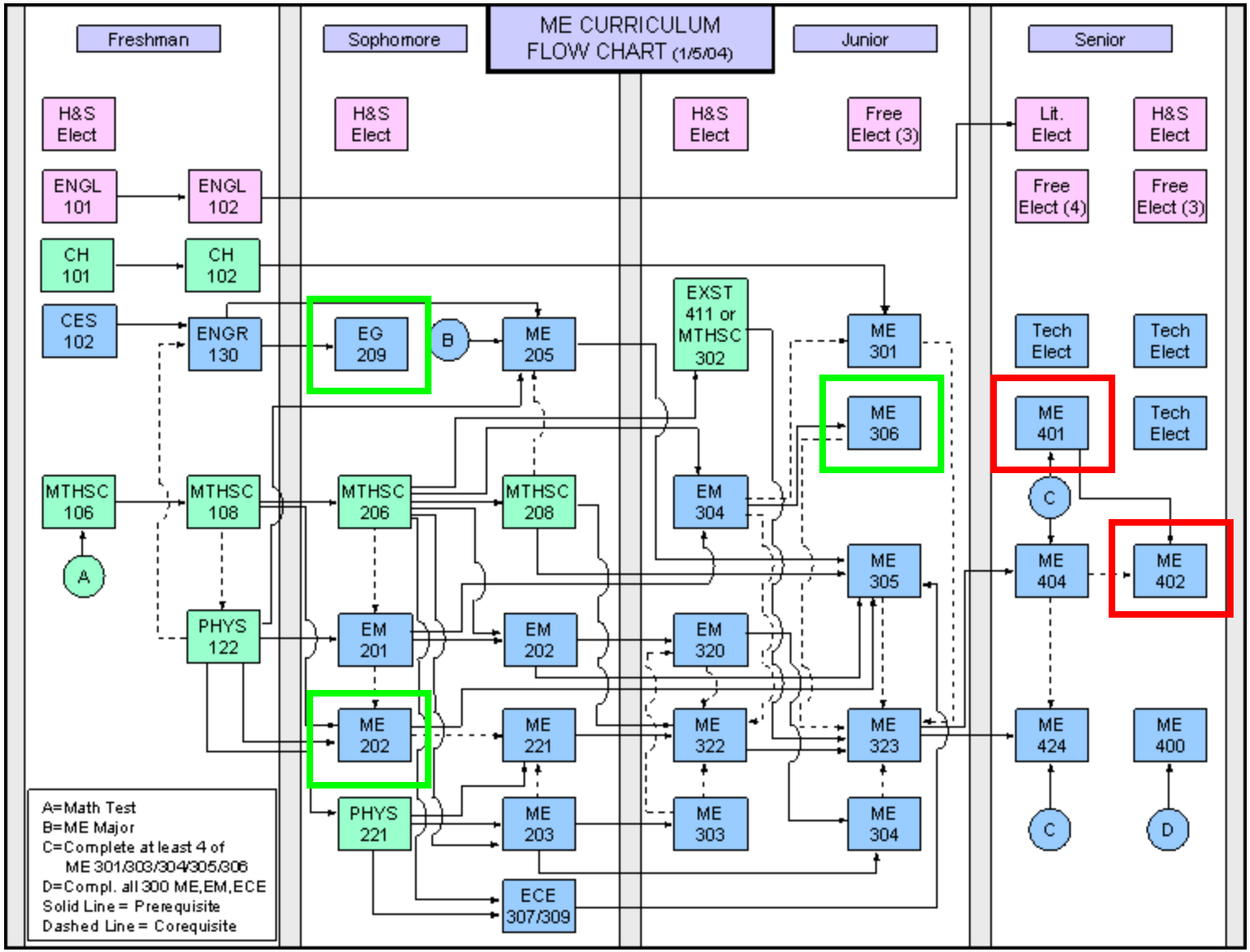
- Clemson University – Mechanical Engineering
  - ME 401 (Senior Design Methods)
    - First semester (~17 weeks) of Senior Design Sequence
    - Three projects (drawing, economics, conceptual); weekly lectures
  - ME 402 (Internship in Engineering Design)
    - Second semester (~17 weeks) of Senior Design Sequence
    - Single project (4 teams of 5 students per project); weekly seminars
- Professor: Joshua D. Summers
  - joshua.summers@ces.clemson.edu
  - http://aid.ces.clemson.edu
  - 864.656.3295 (office)
  - 250 Fluor Daniel Building



Design Sequence



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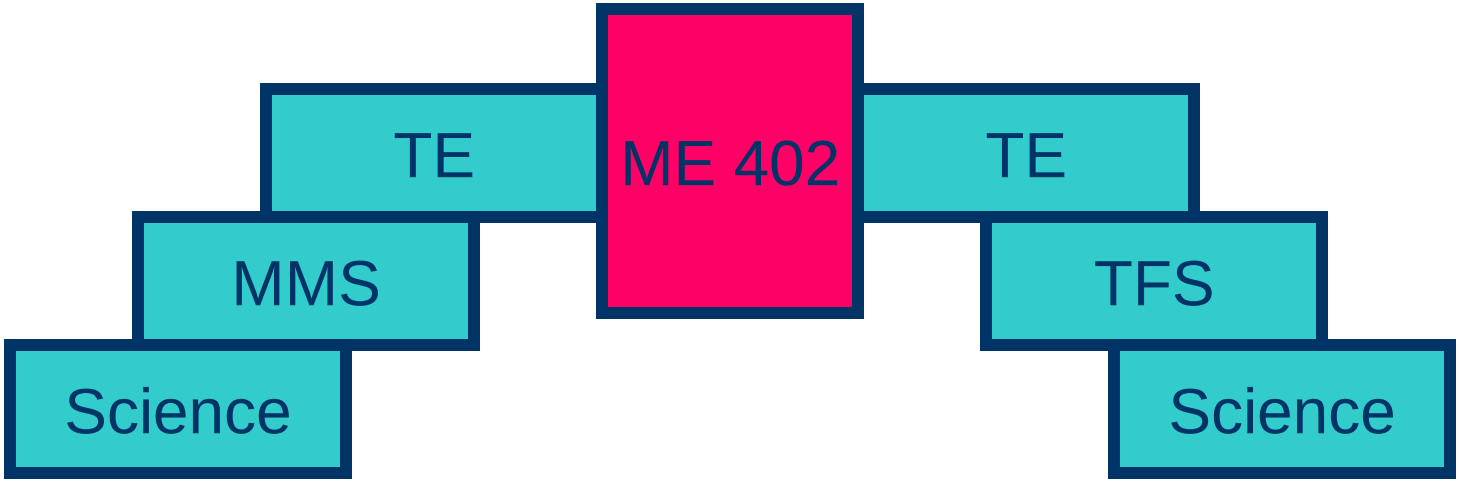
Structure

- ME 402 is the **CAPSTONE** of student's undergraduate program
  - Applies what they have learned
  - Ties together different analysis skills
  - Develops design skills
  - Develops social skills



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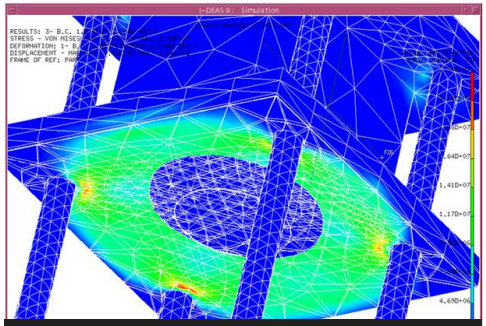
Structure

- ME 402 is the **CORNERSTONE** of student's professional career
  - For many, the first introduction to an industry project
  - Must develop professionally
  - The most important course for most employers



Design of Injection Molding Machine (CETL, Fall 2004)

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Lectures

Date	Topic	Speaker
2009.08.20	Introduction; War Room Rules	**JD Summers**
2009.08.27	Problem Definition	**JD Summers**
2009.09.03	Teaming	**D Wiese, G Trask (Industry)**
2009.09.10	Writing I	**B Ramirez (Studio)**
2009.09.17	Prototyping	**T. Schweisinger (ME Shop)**
2009.09.24	Patents	**V. Abriton (Clemson)**
2009.10.01	Patents	**Ryobi**
2009.10.08	Quality Engineering	**L Fredendall (Management)**
2009.10.15	Writing II	**B Ramirez (Studio)**
2009.10.22	Business Plan Development	**C St. John (Business)**
TBD		
2009.12.03	FINAL PRESENTATIONS	

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Projects – Spring 2009

- BMW
  - Hatch Seal System (demonstrated on X5 SAV)
- Michelin
  - Tire Burnishing System (developed system and method)
- Michelin
  - Tire Fixture for Cutting (built prototypes)
- AEC
  - Film Packing Redesign (integrated hardware)
- Rotary
  - Blade Testing Equipment (hardware and testing)
- SC Institute for Energy Science
  - Low cost energy harvester (system integration)
- Faculty and External Involvement:
  - Summers, Tong, Grujicic, Delhaye, Wagner, Thompson, Weise, Trask, Qiao, Figliola, Ma (L.), Kurfess, Ma (J.), Schweisinger, Sen
- Roughly 100 students involved

Final Presentation to Sponsor for Lunar Wheel (Michelin/NASA, Fall 2006)

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Projects – Fall 2008

- BMW
  - Design of automated screw loading attachment for hand-held device
- Michelin
  - Design of high heels employing advanced non-pneumatic tire technology
- Square-D
  - Design of a low cost, scalable caliorometer for convective measurements
- Timken
  - Solution development for heat treatment washer distortion
- Faculty Involved:
  - Summers, Mocko, Grujicic, Li, Miller, Delhaye, Coutris, Vahidi, Schweisinger
- Roughly 60 students involved

Design of Automated Film Splicer
(Hartness International, Spring 2008)

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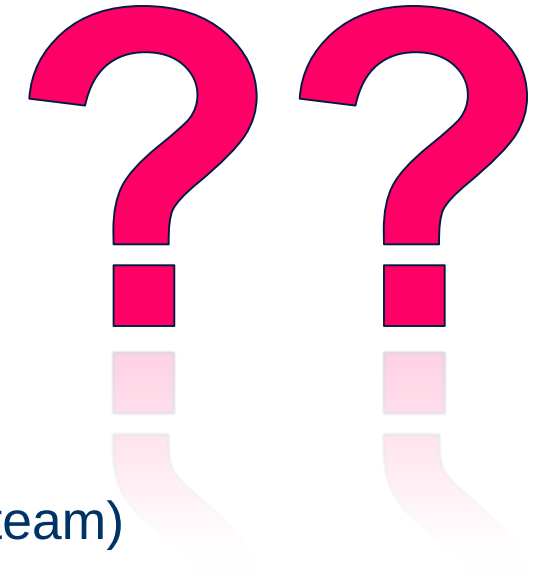
Project – Spring 2010

- Sponsors
  - Michelin: confirmed
  - BMW: confirmed
  - Rotary: being defined
  - AEC: being defined
  - SCIES: confirmed
  - Open
  - Open
- Approximately 90 students
  - 3 teams per project (4-5 students per team)
  - 7 projects needed for Spring 2010
  - 7 projects will be needed for Fall 2010



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Course Structure

- Design Tools
  - Supplemental in workshops
- Design Reviews
  - Weekly advisory committee meetings
  - Mid-term presentation to industry sponsor
- Design Topics
  - Weekly seminars given on practical topics
- Design Practice
  - Design, Build, and Test are expectations
  - Encouraged to hold shorter focused group meetings for integration
- Design Support
  - Prototyping shop (hand/CNC mills/lathes; RP facilities; experimental labs)
  - **Design WarRoom (dedicated facility: lockers, computers, conferencing, meeting room, etc.)**
  - **Computational Lab (dedicated computing facility with advanced CAD/CAE/CAM software)**

Design of Shear Band for Lunar Wheel (Michelin/NASA, Fall 2006)

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Industry Commitments

- From Industry
  - Presentation of Problem @ Clemson (January)
  - Tour and Problem Verification @ Sponsor (January)
  - Mid-Term Presentation @ Clemson/Sponsor (February/March)
  - Final Presentation @ Clemson (April)
  - Contact with Student Teams – as needed
    - (answering questions about the problem)
  - Funding
    - $7,500 for project (equipment, facilities, etc.)
    - $500 per team (prototyping, documentation, travel) + additional per Sponsor

- From Clemson
  - Two faculty per project
  - Three teams of students (4-5 students per team)
  - Additional (graduate TA, graduate coaches, industry retirees)

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Benefits

- Fresh look at your problems through impartial eyes
  - Student teams can bring a clean slate to your problem
- Extended access to graduating engineering students
  - An opportunity to “interview” an entire cohort of Clemson students
- Exposure to the latest tools, techniques, and technology
  - Students and faculty are trained in the latest design and analysis tools, in addition to a broad exposure of cutting edge research
- Multiple solutions using teams
  - Three to four distinct solutions developed, prototyped, and tested for every problem
- Access to Clemson facilities and faculty expertise
  - ME at CU is the largest engineering program in SC, and recognized as one of the top five Design Research programs in the nation
- Four solutions patented in the last five years
  - Sponsors have first right of refusal on all IP developed in the course is available
  - **3 invention disclosures filed in Fall 2008; 4 patents filed in Fall 2006**

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Contact Information

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