Junior Convocation
2015
Mechanical Engineering
Drazen Fabris
Tim Hight
Outline

• A note on the Fundamentals of Engineering exam
Senior design
• Motivation
• Procedures
• Senior project examples
  List of projects at
  http://www.scu.edu/engineering/me/projects.cfm
• Q&A
Fundamental of Engineering

- First step to a Profession Engineer certification
- Demonstrates your knowledge as an engineer
- Useful for job interviews
  - Item on your resume
  - You will verify what you know or don’t and you will be prepared for the interview
- The Mech. Dept. will subsidize
Goal (Challenge)

• In 2015-16 we will have our second largest senior design class

• We want 100% of the projects to be successful
  – What does that mean?
Goals

• Work on in an area that is interesting and that you can apply yourself
• Work in a good group
• Good interaction

Your senior project will demonstrate what you can or cannot do. It is a compliment to your academic record, work experience and skill set.

• Work leads to successful completion (following the rules and it works) and a sense of accomplishment.
Procedure

• Check out the descriptions, discuss with faculty (make an appointment).
  http://www.scu.edu/engineering/me/projects.cfm

• Submit a proposal to the Department office:
  – Project description
  – Itemized deliverable goals
  – Student team (include your resumes)
  – Estimated cost
  – Requested advisor

• Proposals due by May 21st. Projects start only with the commitment of an advisor and department approval. Some projects have special rules.

• We may send back projects based on questions raised or need for details to be specified. You may submit a draft proposal.

• Two team could potentially do the same project.
Constraints

- Tech writing, Engl 182a and 182b, should also be signed up as a project group. You must choose the Engl 181 sections assigned for Mech students.
- GO TO SENIOR DESIGN PROJECT PRESENTATIONS this year
Avoid pitfalls

• Group personal dynamics
• Lack of planning/scheduling
• Designing too late
• Not asking questions (making assumptions)
• Spinning the results
• Repeating last year’s ideas/equipment
• Be aware of the effort required
Sample senior projects

Aerial Drone Project(s) – potential for two groups: adaptation/extension of off-the-shelf aerial drones (octocopters and possibly fixed-wing and/or hybrid vehicles) with novel imaging payloads (visual, multispectral, infrared) and post-processing software (orthomosaicing, 3D modeling) to provide new services for collaborating clients/customers (SCU facilities dept, SCU alumni office, local wineries, local farms, marine scientists, etc.). Technical extensions include enhanced autopilots, on-board radar and relative navigation, inter-vehicle collaboration, etc. Control systems, mechatronics, programming experience desired for a team of 3-6 students; one or more of the team should ideally have drone-flying experience. Completion of a 1-unit aerial vehicle operations course will be required. Initial funding and professional partnerships exist for these projects; a summer internship may also be available.
Team SCRUB, R. Marks

We all know SCU has been on a mission to institute state of the art classrooms such as EC602. Instructors love the extensive writing space and students can’t get enough of the colorful and rotating chairs. But then class is over and Dr. T makes you wipe down the walls before you can even ask her a question.

Now is your chance to save future SCU alums from this misery. The mission: create a device that will automatically clean the writing space in a classroom such as EC602. Interested in working with a COEN and/or ELEN student? The final device might be integrated with other classroom features so that it can be operated through the same user interface that controls all 7 projectors in the room. Ideal for 3–4 MECH students plus students from other departments depending on overall scope.
Sample senior projects

Team Centrifuge, R. Marks
A class of 2014 team designed and assembled a centrifuge for our materials lab. Their analysis predicts the centrifuge should operate up to rotational speeds of 2,000 rpm; however, validation of this design is needed. If you are interested in troubleshooting a control system and extensive testing of an existing device, then this project is for you. Ultimately, classification of sedimentation rates and other properties of various suspensions is needed. Controls, dynamics/vibrations, and fluids are the key areas of expertise required. Ideal for a team of 3 MECH students.
Sample senior projects (H. Lee)

1. Body heat energy harvester for wearable device. (EE, ME)
2. Smart irrigation control with plant health monitoring. (EE, CS, ME)
3. Portable cooler. (EE, ME)
4. Smart appliance control with usage pattern detection. (EE, CS, ME)
Sample senior projects

**Land Rover Advanced Navigation**: extension to existing autonomous driving capability for a 6-wheel Gator class all terrain vehicle. The vehicle currently operates in a student-developed drive-by-wire mode with limited autopilot capabilities. Possible directions for development include advanced autonomous navigation, obstacle avoidance, adaptive navigation, and tele-operation. Control systems, mechatronics, programming experience desired for a team of 3-5 students; one or more of the team should ideally have experience maintaining/tinkering with automobile systems. Initial funding exists.
Sample senior projects

Mission control for NASA satellites: development of analysis, decision-support, and automation systems for operating real NASA spacecraft. Student team will work with an existing team of students and NASA scientists/engineers to support the orbiting NASA O/OREOS satellite as well as 8 new spacecraft currently in development and scheduled for launch in late 2015. Control systems, mechatronics, programming experience desired for a team of 2-4 students; one or more of the team should ideally have experience maintaining/tinkering with wireless communication systems. Completion of a 1-unit satellite operations course will be required. Initial funding and professional partnerships exist for this project; a summer internship may also be available.
Sample senior projects

**Marine robotics**: several opportunities exist for the development of deep sea instrumentation, underwater robots, and automated boats. Completion of a 1-unit marine operations course will be required. Team sizes of approximately 2-4 students. Initial funding and professional partnerships exist for this project; a summer internship may also be available.
Sample senior projects

BioPrinter: continuation of a 3-D bioprinting project currently being advised by Asuri and Kitts. Extensions to current work include improved motion and printing control, thermal control, multi-material handling, multi-stage processing, process automation, etc. Team size approximately 2-4 students. Work includes interaction with a local start-up.
Sample senior projects

Multi-robot control systems. RSL performs research work in controlling groups of robots for advanced applications ranging from manipulating objects to monitoring the environment, and these control systems are applied to many of our robotic systems, such as underwater robots, boats, land rovers, and aerial vehicles. Students interested in working in this area, possibly as a precursor to a 5-year program Masters Degree are invited to discuss this possibility with Dr. Kitts. Control systems, mechatronics, programming experience desired.
Questions and Answers

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