May 2018

Introduction to ENSC 405W

"We suffer to learn."

–*Aeschylus* (c. 525-456 BC)

Learning Objectives

- At the end of this module, you will understand how ENSC 405W is organized and graded.

- In addition, you may have started to consider some basic issues related to sanity:

  - You are crazy to take these courses
  - You are insane to want to be an Engineer
  - The course instructors and TAs are also certifiable
  - My commitment papers to Riverview Psychiatric Hospital are hanging on my office wall. Drop by, and I will show them to you :-)

Rumours

- What have you heard about ENSC 405W/440?

"In my opinion, ENSC 440 has provided me with the opportunity to work more than eight hours after school each day and show up in SFU seven days a week."

–*Patrick Pun*, 2000

"The technical and interpersonal communication challenge of working on a project from its inception to full completion makes ENSC 440 one of the most valuable courses that I have taken so far."

–*Veljko Jovanovic*, 2000

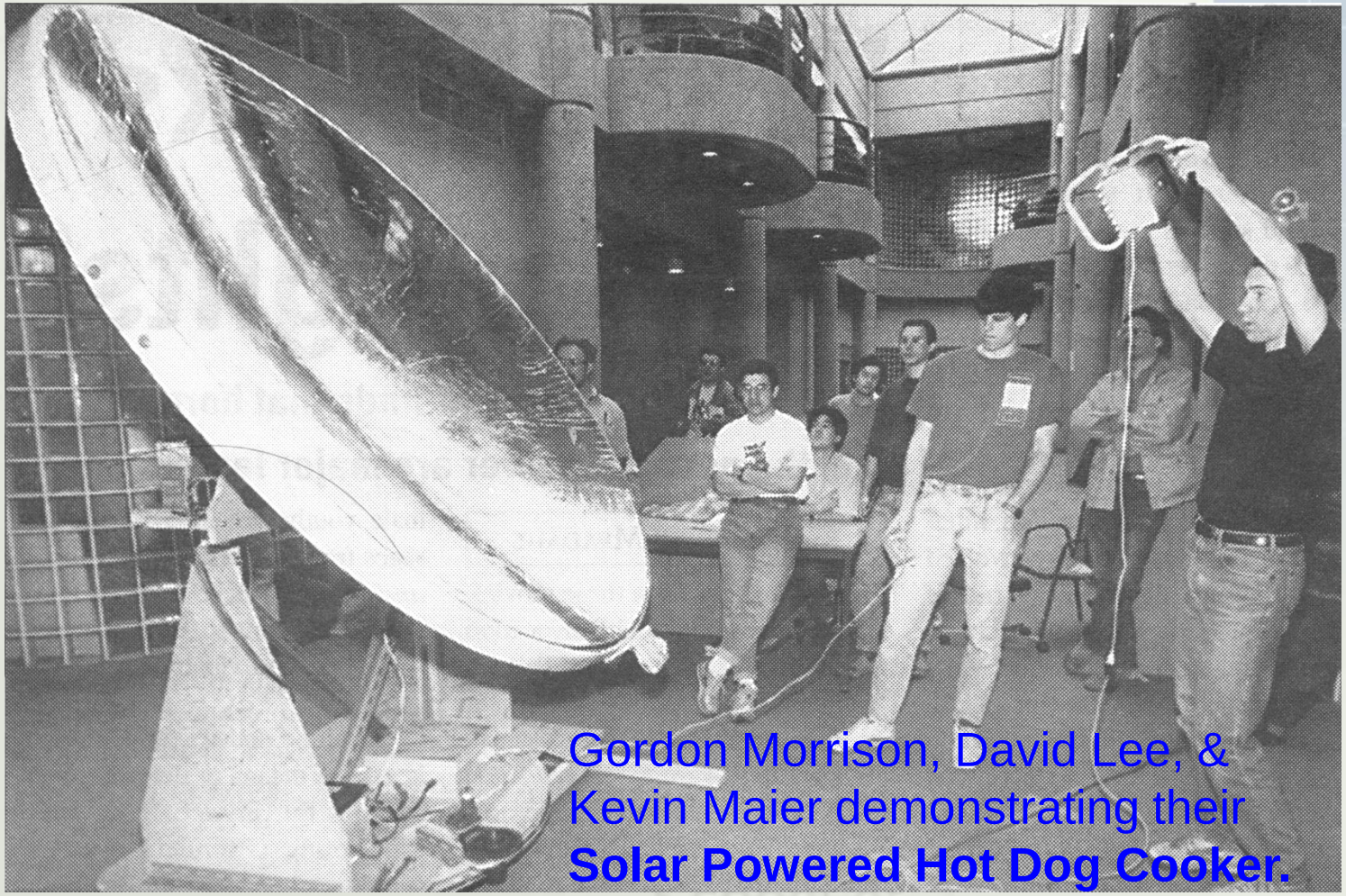
Selected Previous Projects

- The ENSC 305W/440/405W website has 20 years of projects archived on it. Search for keywords related to your project.
- **Be cautious as the documents vary greatly in quality and the examples rarely match the latest rubrics.**
  - Ultrasonic measuring system
  - Refreshable Braille display
  - Dissolved oxygen sensor (for Environment Canada)
  - Solar Panel De-Icer (for BC Hydro)
  - Small heart imaging system (Kinesiology)
  - Venipuncture site locator (Kinesiology)
  - Electronic counter-sniper system (Scary)
  - Bacteria classification assistant (Biology)
  - Electronic cat toys/automatic cat feeders/pill dispensers (***yawn***)
  - Shopping cart following and/or checkout systems (***sigh***)

Quality 405W/440 Projects (2017/2018)

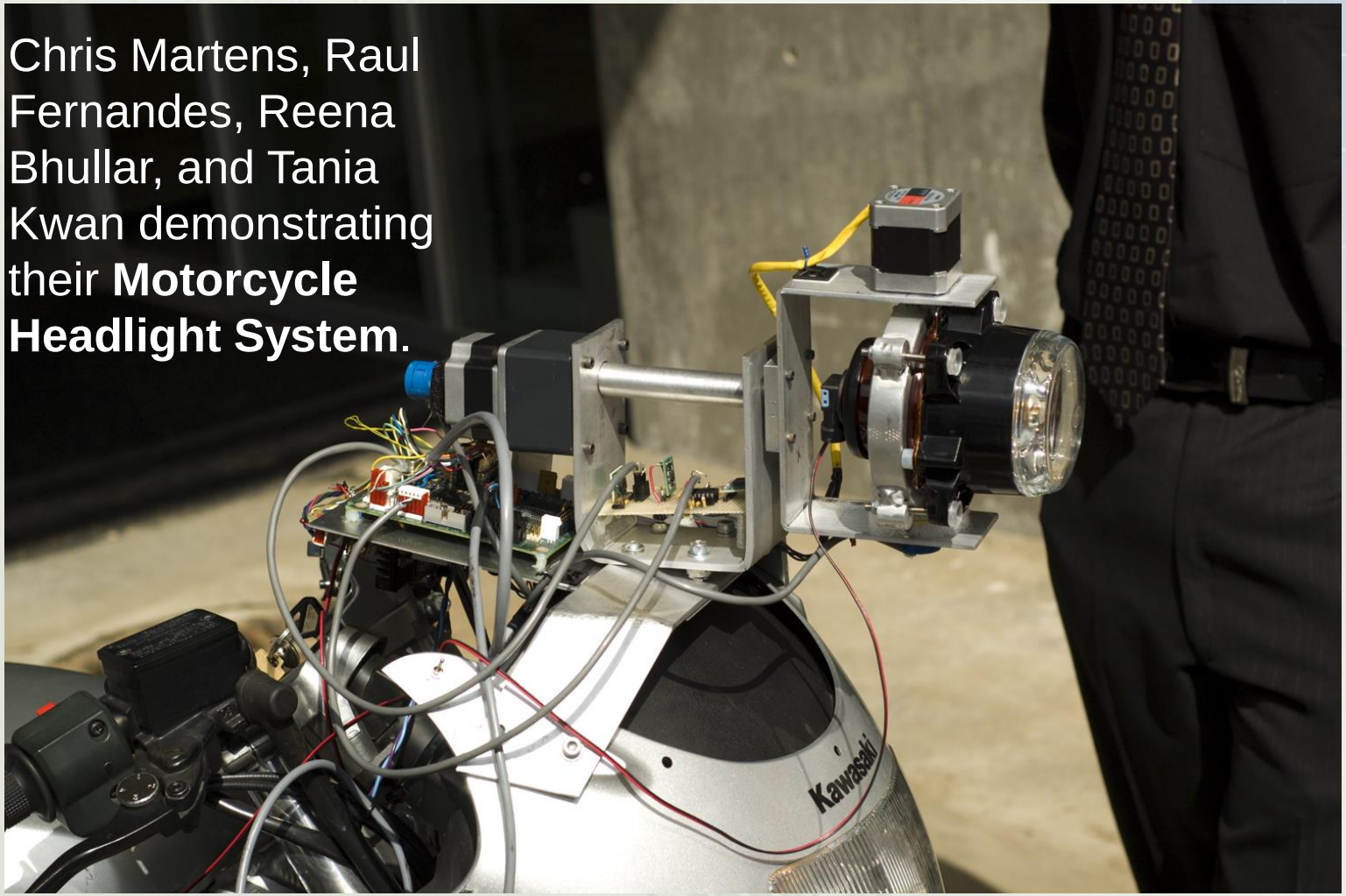
- **LumoTech (Team 3 -- 2017):**
  - Stylus system for taking notes
  - Very good to excellent quality docs
  - Interesting and challenging project
- **CaneTech Solutions (Team 5 -- 2017):**
  - Smart cane for visually impaired
  - Good to excellent quality docs
  - Interesting and challenging project
- **ThinkUp (Team 5 – 2018):**
  - Portable EEG
  - Excellent quality documents
  - Interesting and challenging project
- **Paintbot Inc. (Team 7 –2018)**
  - Automated room painting robot
  - Good to excellent quality docs
  - Interesting and challenging project

Just How Crazy Are Engineers?



Gordon Morrison, David Lee, & Kevin Maier demonstrating their **Solar Powered Hot Dog Cooker.**

Even More Crazy!



Chris Martens, Raul Fernandes, Reena Bhullar, and Tania Kwan demonstrating their **Motorcycle Headlight System**.

Yet More Craziness?

Faisal Emami, Terry Hannon, Jane Horton, Alex Naylor, Jeffrey Shum, & Mike Thiem:

The ENSC Grow-Op!

Talented & Crazy Engineers?

http://youtu.be/dqSeh4C7vZw

Arta Ahrabi, Chakaveh Ahmadizadeh, Ibrahim Appiah, Wael Jendli, & Ahmed Medhioub demonstrating their **Smart Bicycle Helmet System.**

Search Youtube for project ideas!!!

Purpose of All This Craziness?

- To demonstrate what you have learned over the past 5+ years by asking you to undertake a significant design project that expects you to integrate the skill sets you have learned:
  - Time management and professionalism
  - Teamwork and interpersonal skills
  - Critical and creative thinking
  - Entrepreneurial and project management skills
  - Oral and written communication
  - Persuading and informing
  - Graphic design and human factors
  - Social, environmental, and ethical factors
  - Engineering design and technical skills

Method for ENSC 405W/440

- Guided by a few lectures on selected topics, you are required to **simulate** a start-up company focusing on the proposal, research, analysis, design, and development of a project of interest to you.
- Ideally, the project will also meet a **social need** and may have the potential for a **marketable product (or research project)**.
- Initially, you will need to come up with the following:
  - A project of interest and merit (hardest task – find a problem)
  - A team interested in the project (How many teams?)
  - A company name and logo (be creative here)
  - A source of funds (contact ESSS ASAP; Andrew handles Wighton)
- **Treat 405W/440 like a part-time job rather than a course.**

Choose a Project that Will Wow Us

- The *Wow* factor is very important when demoing a new idea/product to those who might consider funding it.
- Andrew wants to see something he describes as ***Sexy***.
- More classically inclined, I want to see what Aristotle describes as ***Spectacle*****.**
- Teams should contact Andrew with a couple of project ideas in the first 2 weeks of the semester (if you haven't already done so). You can also drop by my office to talk with me about your ideas (Mondays, 13:00-15:00, and Tuesdays,11:00-13:00). E-mail also works well for me.

Accreditation Issues

- ENSC 405W/440 provides the ENSC Senior Design Project as required by CEAB (Canadian Engineering Accreditation Board).
- ENSC 405W is also certified as the ENSC upper division Writing Intensive Course as required by SFU.
- Both have implications for how these courses are designed and our expectations for how the assignments must be completed. **Mediocrity is not rewarded.**

What is Innovation?

- Note that you will find a lecture posted on the ENSC 405W/440 website about creative thinking. I recommend that you read it carefully and then reflect upon your own creativity and how you can become more creative.
- Creative thinking is simple: take something where you have significant expertise and apply it in a weird/strange/different/ paradoxical/contradictory/unrelated context.
- In other words, take some idea/technology/theory you know very well and rub it against something you don't know much about. Analyse the result. See if that friction can start a fire.

- If so, the rest of the world may call that result **INNOVATION**

Brainstorming for ENSC 405W/440

- We recommend you meet as a team later this week and brainstorm ideas for your project (if you already in a team and you know what you are going to do, then start planning).
- Pretend this is play, not work. A blackboard and coloured chalk helps.
- Someone should take responsibility to record all the ideas.
- Each team member must come up with a possible idea for the project.
- Ensure everyone's idea has a chance to be heard.
- Remember to first focus on the problem, not the technology.
- During your meeting, anything goes – no matter how crazy it may seem. Have fun. Beer or wine, in moderation, sometimes helps.
- List all the ideas. Don't commit to the first idea that seems plausible. Often, first impressions are misleading.
- Finally, critique the initial ideas to produce a rank-order list to discuss with Andrew and/or Steve.

Some Key Advice for 405W/440

- Identify a problem, then find a solution – **GOOD!**
- Find a technology and fit it to a problem – **BAD!**
- The key goal is for you to learn a sound approach to the engineering design process.

Problem: The elderly in nursing homes lack contact with pets, a known way to calm people suffering from anxiety. Unfortunately, some elders, if they suffer from dementia can be a hazard to pets. And pet maintenance (or supervising the interactions) are costly.

Solution: RoboCat (*Joy for All*) arrived in 2015. And Hasbro tells us that the elderly like them ;-) → **RoboCat**

Names and Logos

How to Contact Me

- My office is **ASB 9870** (I am usually in on Mondays and Tuesdays after class – feel free to drop by). Otherwise, send me an e-mail for an appointment.
- My e-mail address is **whitmore@sfu.ca** (contact me via e-mail with questions relating to the course or to set up an appointment). **This is the best way to contact me.**
- My phone number is **604-319-2709 (C)**. **Only for use in emergencies.**
- All course materials will be posted on the website: **http://www2.ensc.sfu.ca/~whitmore/courses/ensc305/** Usually posted 1-5 days after the lecture.
- Website will be updated later today.

ENSC 405W/440 Personnel

- Andrew Rawicz (rawicz@sfu.ca) officially teaches ENSC 440 and Steve teaches 405W, but the courses are closely integrated. Andrew is involved in 405W, and Steve is involved in 440.
- 70% of the grades for 405W are based upon project documentation.
- 70% of the grades for 440 are based upon technical excellence.
- Treat the two courses as a single extended course.
- ENSC Personnel provide technical expertise and document grading:
  - **Shaun Fickling** – Assesses Proposals, Requirements Doc, Design Specs as well as the UI Design, the 440 Project Planning, and Test Plan Appendices to the Design Specs.
  - **Steve** – Reviews the Proposals, the UI Design, and the Project Planning Appendices (to the Design Specs), as well as assessing the Engineering Journals, Participation, and Team Dynamics.
  - **Andrew, Steve, and Shaun** all assess the Design Progress Meetings and the Poster Presentations.
  - **Angelus** (Lab Operations Coordinator) and others train and assess ENSC 405W/440 students in the safe and appropriate use of shop equipment.

Attendance

- We meet from 08:30-10:20 on Tuesdays (AQ 3159) and 08:30-10:20 on Thursdays (ASB 8806A). (Please note exceptions on the website).
- **Attendance will be taken. Absences and lateness will be penalized.**
- Attendance to ENSC 405W is mandatory with the following exceptions:
  - Only those who are seeking an honors degree (i.e., writing a thesis) are required to come to the thesis lecture. Attendance is taken, and dough-nuts/coffee/tea are supplied. Undergrad Assistant will also attend.
  - Those who have completed ENSC 304 with at least a C- can skip the lectures on User Interface Design (if, and only if, they send me an e-mail).
  - Everyone is allowed one unexcused absence (not including thesis lecture or guest lectures). After that, you lose 50% of your professionalism grade for every absence (3 missed classes = 0). A doctor's note, etc., is required.
  - WHY? Both ENSC 405W and 440 have a limited number of classes. **Your attendance serves as a proxy for professionalism.**
- **Under no circumstances sign in for an absent team member as academic integrity penalties are applied to both people.**

Topics Covered in ENSC 405W

- Time management and team meetings
- Creative thinking and the design process
- Writing project documents: engineering journals, proposals, requirements/functional and design specifications, meeting minutes, user manuals, poster presentations
- Collaborative writing and listening skills
- Group dynamics, dispute resolution, project management, and leadership
- Review of sentence style (via user manuals)
- Usability/User Interface design and design processes
- Team oral presentations (design progress meetings)
- Safety and standards

ENSC 405W Schedule for Summer 2018
Lecture Schedule, (Tuesdays, 08:30-10:20, AQ 3159)
Workshops (Thursdays, 08:30-10:20, ENSC Machine Shop, 8806A)

Dates	Lecture Materials/Tasks
Week 1: (May 07-11)	**Tues: Lecture:** ENSC 405W Introduction; Time Management, Meetings, Engineering Journals, Rubrics; Team Assembly **Thur:** Independent Work on Projects
Week 2: (May 14-18)	**Tues: Lecture:** Collaborative Writing & Proposals; Team Dynamics, Leadership, Conflict Resolution **Thur:** Independent Work on Projects
Week 3: (May 21-25)	**Tues: Guest Lecture:** Engineering Design, Andrew Rawicz (SFU) **Thur: Workshop:** (Team A, Team H)
Week 4: (May 28-June-01)	**Tues: Lecture:** Engineering Safely; Listening Skills **Thur Workshop:** (Team B, Team G)
Week 5: (June 04-08)	**Tues: Lecture:** Specifications & Design Processes; User Manuals, Style Review **Thur: Workshop:** (Team C, Team F)
Week 6: (June 11-15)	**Tues: Lecture:** Project Management; Poster Presentations **Thur: Workshop:** (Team D, Team E)
Week 7: (June 18-22)	**Tues: Oral Presentations:** Design Progress Meetings (15 Minutes/Team; Location & Teams are TBA) **Thur:** Independent Work on Projects
Week 8: (June 25-29)	**Tues: Guest Lecture:** Designing for Human Factors and Usability: Part 1, Mike Sjoerdsma (SFU) **Thur: Guest Lecture:** Canadian Standards Association, Ken Rutledge (CSA) -- Tentative
Week 9: (July 02-06)	**Tues: Guest Lecture:** Designing for Human Factors and Usability: Part 2, Mike Sjoerdsma (SFU) **Thur:** Independent Work on Projects
Week 10: (July 09-13)	**Tues:** Independent Work on Projects **Thur:** Independent Work on Projects
Week 11: (July 16-20)	**Tues: Lecture:** Theses (9:30-10:30) – Honours Students Only (location TBA) **Thur:** Independent Work on Projects
Week 12: (July 23-27)	**Tues: Oral Presentations:** Design Progress Meetings (15 Minutes/Team; Location and Teams are TBA) **Thur:** Independent Work on Projects
Week 13: (July 30-Aug 03)	**Tues:** Independent Work on Projects **Thur: Poster Presentations:** (ASB South Atrium: 08:30-11:30)

Revised: 21/05/2018

Assignments for 405W

Due Dates	Assignment	Length	Weighting
Throughout	Professionalism & Class Attendance	N/A	10%
Thur, May 31	Project Proposals	15-20 pages	10%
Thur June 07 & Thur July 26	Teamwork Inventories (X2)	N/A	P/F
Tues, June 19; Tues, July 24	Design Progress Meetings (X2)	15 mins/team	10%
Thur, June 21	Requirements/Functional Specifications	15-20 pages	15%
Thur, July 26	PoC-Prototype Design Specifications	15-20 pages	15%
Thur, July 26	UI Design Appendix	5-10 pages	10%
Thur, July 26	440 Project Planning Appendix	5-10 pages	10%
Thur, Aug 02	Engineering Journals	Varies	10%
Thur, Apr 02	Poster Presentation/Demo	3 hours	10%

Except for the Engineering Journal, all documents must be submitted as e-mail attachments (in .pdf format) to Steve by the deadlines. **If you want the project documents to remain confidential, inform me ASAP, or I will post the documents on the website after the Proposals are graded.**

Grade Equivalency Table

Letter Grade	Definition	GPA	Percentage
A+	**Excellent Performance**	4.33	96-100
A		4.00	91-95
A-		3.67	86-90
B+	**Good Performance**	3.33	81-85
B		3.00	76-80
B-		2.67	71-75
C+	**Satisfactory Performance**	2.33	66-70
C		2.00	61-65
C-	**Marginal Performance**	1.67	56-60
D	**Unsatisfactory Performance**	1.00	51-55
F		0.00	00-50

A Note about Quantity of Writing

- **A few have complained about too much documentation.**
- If you follow the documentation length guidelines, you will write about 100 pages per team for the project documentation = 20 pages per person for a 5 person team, and is equivalent to the required term paper for most 3 credit courses.
- You are also required to keep a journal.
- But given the limited hours of lecture, and the Writing and Capstone designations, 20 pages is far from excessive.
- Documentation is key to the Engineering Design Process.

- **Follow the length guidelines and share the writing tasks!**
- **Andrew and I hate long documents. Be concise!**

Grading for ENSC 405W

- Assignments are graded from A+ (96-100%) to F (0-50%).
- Assignments must be submitted on the date they are due; late assignments will be penalized 10% per day late.
- **Exception:** Each team is permitted one free late (maximum 3 days), which may only be used for the requirements specs (difficult) or the design specs (long).
- 405W uses rubrics and assigns final grades that have an obvious connection to the weighting of the assignments. **Please read the rubrics – submissions that fail to address the rubric will receive low grades.**
- 440 is graded more holistically. The opinions of Steve and the TAs are factored into Andrew's calculus.

Grading for 405W (cont'd)

- **Academic Honesty Policy:** passages, figures, and tables from external sources must be cited in text and referenced in the document (IEEE format). Place large excerpts (i.e., standards, graphics, etc.) in appendices & reference.
- 1st infraction = 0 on the document and a rewrite;
- 2nd infraction = recommendation to Director for FD in both 405W/440.
- Most of these docs are team-written and are thus a team responsibility. If one person plagiarizes, all are held to account. Review the complete document before submission.
- Don't even think of faking the journal – very easy to catch – you'll receive a zero for it.

Grading for 405W (cont'd)

- Instructors generally read/scan everything, but . . .
  - TAs are assigned to grade specific docs (Proposals, Requirements Specs, Design Specs, Design Spec Appendices).
  - I also assess the Engineering Journals, Participation, and Teamwork.
  - We all grade the Posters and Design Progress Presentations.
- You should consult with the TAs about technical matters. A list of TA technical expertise will be provided.
- Consult ENSC faculty. They have a great deal of expertise. Use that expertise (you are paying for it!).
- We expect to have about 6-8 teams (~36 students).

Grading for 405W (cont'd)

- A's for some team members and B's for others also possible. This depends upon individual assignments (professionalism/attendance and the journals) as well as the team evaluations.
- Rubrics are available on the website for the proposals, requirements/functional specs, design specs, design progress reviews, posters, and engineering journals.
- These rubrics are part of CEAB's requirement that ENSC demonstrate specific learning outcomes.
- **Read the rubrics carefully as the instructors and TAs use them when grading. I recommend you print copies and keep them with the Course Outline & Schedule.**
- **Watch for updates as the semester progresses!**

Facilities

- Currently, the Machine Shop/URL will function for assembling projects. The North end of Lab 1 also has some space.
- Do not expect to leave projects under construction in Lab 1 (material gets stolen or damaged).
- Teams can send an e-mail to ensc-res@sfu.ca requesting a locker for this semester. **I suggest you do this ASAP!**
- **Think Safety!** Do not bring flammable materials, chemicals, or liquids into the labs (including motorcycles).
- Do not deface/damage the lab benches or sidewalks (no glue/razors/spray paint). Do not disassemble lab equipment.
- NB. Lab 1 is now monitored by security cameras.
- Use some common sense here. **Think before acting!**

HELP – We Are in Trouble – 1

- Make an appointment to see me if you encounter problems related to group dynamics. The sooner you contact me, the more likely the problem can be resolved. **Do not wait until week 12 to tell me that your team is falling apart.** We need to know about problems by week 6, at the latest, if we are to have any hope of resolving the problems.
- You are required to complete 2 teamwork evaluation inventories during the semester. **If there are teamwork difficulties, make that clear in these forms.** I will set up meetings to resolve the problems.
- **Group problems will happen. Sources of conflict:**
  1) Work sharing (most common = differential grades/failure)
  2) Leadership contention (mainly cursing = gales of laughter)
  3) Personality differences (grinding of teeth = loss of friends)
  4) Design approach (messy problem = failure/lower grades)
  5) Gender/Cultural Sensitivity Issues (rare = bad shit)
- But 84.42% of the time things work out fine!

HELP – We Are in Trouble – 2

- For technical issues (design, parts selection, etc.), talk with the TA and technical faculty. For documentation questions not covered in lectures or on the website, e-mail me.
- If you encounter a personal crisis (suicidal thoughts, serious illness, grief, etc.), phone me.

> "One thing that we could have done better is project scheduling. Because we started our brainstorming in the summer, we fell into a bit of a trap thinking that we were ahead of the schedule."
>
> –*Erik Haberger*, 2001

- **No one has yet died while taking 305W/405W/440, but some have wished that the instructors would do so.**

Conclusion

“We learn to suffer.”

–*Sophocles* (c. 496-406 BC)

All teams must complete an index card listing all **team members**, their **options**, and their **e-mails**. Please designate one of the people as the **team contact** with an asterisk (*). Thanks.