Industrial Projects offered by Professor Jonathan Black projects:

**General Notes:** Prof. Black supervises M.Eng. design projects on a team basis, with the intention of providing a group experience that closely replicates industrial design activities. The chartering of any one team depends upon the appropriate group of students, with individual skill sets, being available for that project. The attached project briefs are correct as of 7/10/12 but are subject to change. Several others are under discussion and Prof. Black is open to considering student initiated design problems.

**Schedule:** A full presentation concerning each project will be made during MEng orientation on Monday, August 13. Prof. Black will be available during the following week for individual discussions (Weill 406); enquiries may be made by email: jb2245@cornell.edu.

Prof. Black will be holding extended, open office hours Tuesday August 21, 10:30a – 12:30p in Weill 221. Teams will then be selected and finalized within 24-48 hours. Students interested in any of these projects should email the following information to Prof. Black, as soon as possible:

1. Projects desired, in order of preference.
2. Summary, by course titles, of courses you took during your Junior and Senior years as an undergraduate.
3. Title and date of any academic degrees (or other professional preparation) that you have completed post-High School.
4. Particular personal skills that may be applicable: foreign language reading/translation abilities, graphics and/or FEA program familiarity, etc.
5. Best way to contact you (as well as email address, and AIM or Skype name).
6. A brief personal statement touching on:
   a. Reasons for electing to enter the M.Eng program at Cornell.
   b. Reasons for selecting the particular design project (primary choice).
   c. Primary initial objective after completing the M.Eng degree.

6). **Project Title:** Improving Safety and Utility of Closed Chain Exercise Equipment for Seniors
   Sponsor: In negotiation
   Contact: Jonathan Black

**Problem statement:**

Considerable attention has been given to design of new facilities and specialized equipment for fitness training of the significantly disabled. However, increasingly in recent years people over the age of 70 are being attracted to gyms and exercise facilities by tailored programs such as Silver Sneakers™. Even such relatively healthy seniors have strength, memory, attention and sensory deficits suggesting that the unsupervised use of free weights and range of motion machines (that require changing weight plates by hand) is unwise. Seniors are discouraged from progressing with fitness training because they have trouble transitioning to the use of safer closed chain machines (with prescribed ranges of motion and constrained weights). Thus an opportunity exists to design novel adjuncts to existing closed chain exercise machines with the following principal (required) characteristics:
• Can be placed and removed easily on existing machines, without alteration or adaptation.
• Are attractive with intuitive function and use
• Enable safe unsupervised exercise by healthy seniors with various age-related deficits

**Project field:** Problem and application analysis, mechanical design, prototype construction, lab and field evaluation, human factors.

**Team requirements:** This is a team project for 2-3 people with primarily mechanical engineering background. Some UG training in psychology would be an advantage for one or more team members.

**Project elements:** The project will be conducted as a classical design project:**

- Background and literature research
- Field observation
- Define problem(s)
- Analyze key performance aspects and specify target parametric values (and criticality)
- Develop alternative design approaches
- Screen for feasibility and elect one or more designs, per device, to elaborate
- Fully develop selected alternative(s)
- Fabricate test articles
- Functionally (and possibly field) testing of prototype devices
- Fully evaluate completed designs and select preferred one per device.
- Prepare and present final report.

There will be periodic intermediate design reviews, a final design report (with design history) will be written by the team and presented in a formal final public design review. Opportunities will be arranged to meet with trainers and rehab experts and to observe elderly rehabilitation and training sessions.

Mentors: Prof. Jonathan Black (jb2245@cornell.edu, skype: jonathanblack39), Sponsor representative (to be named), physical trainer and laboratory collaborator (also to be named)

* A collaborator with mechanical fabrication facilities will be identified and recruited during the Fall 2012 semester.