Detailed course information for WDDC

This document describes what each WDDC student and project group should expect as far as class structure, responsibilities, deliverables, and resources during the term. If you have any questions, don't hesitate to ask Amos.

Instructors:
Amos Winter, Graduate Student, Mechanical Engineering
Amy Smith, Senior Lecturer, Mechanical Engineering
Lecture: Fri, 3:00 - 5:00 PM, Room 5-134
Lab: TBD

1) **Course breakdown** – The course units are broken into 2-2-2 corresponding to Lecture-Lab-Homework.
   a) Lecture – Each student is required to attend the lectures but is allowed to miss two during the semester. More than two absences without permission from one of the instructors will result in failing the course.
   b) Lab – A lab time will be chosen on the second day of class. This time will be reserved for group presentations. Project teams will be required to meet weekly with their lab instructors, but may choose to do so outside the designated class lab time (see the Term project – Group meetings section).
   c) Homework – Homework will consist primarily of readings and short assignments to be handed in. Assignments will be due one week after being assigned. As the semester progresses less homework will be given to allow more time for the project.
   d) Grading – Final course grades will be P/D/F. Lab instructors will assign grades for all students in their section. Instructors will collaborate to ensure that there is equitable grading between lab sections. Half of the total grade is based on individual work and the other half is based on teamwork. Class and lab participation grades are based on both attendance and quality of in-class activity. The grading breakdown is:
      i) Class participation/homework: 15
      ii) Strategy presentation: 20
      iii) Concept presentation: 20
      iv) Most Critical Module (MCM) Presentation: 20
      v) Final presentation and prototype: 25

2) **Term project** – Students will form into lab groups, 3 to 5 members plus a lab instructor, to work on a project (either from the website or proposed by a student) for the term. While participating in the project, each group will have the following responsibilities:
   a) Collaboration – The project is meant to be a true collaboration between MIT students, experts who work in each project field, and African wheelchair technicians. Each team is required to send a **weekly update email to both the project mentors and African partners** to demonstrate their progress and obtain

feedback/ideas. Mentors and African Partners will be assigned to project teams after the teams have been formed.

b) Group meetings – Each project group is required to meet once a week with their lab instructor. It is up to the group and lab instructor to choose the best meeting time for all, which does not have to be the scheduled class lab time. The group is encouraged to pick a time that overlaps with open hours of facilities that might be useful to the project (e.g. the Hobby Shop, Edgerton Shop, Foundry, etc).

c) Deliverables – Each group will need to produce the following deliverables:
   i) A PowerPoint presentation for the Strategy, Concept, MCM, and Final Presentation milestones.
   ii) Poster – The Museum of Science in Boston is going to display the class projects on Sat, May 12. Teams will make a poster summarizing their work to display with their prototype. Teams may also choose to give a presentation at the Museum.
   iii) Prototypes – A physical solution to each teams' MCM will be presented at the MCM presentation. For the final presentation a working prototype of a full solution to the team's problem is expected. For example, if a team designs a new wheelchair frame, a finished frame on an assembled, usable wheelchair is expected. For teams doing business plans or other projects that do not require hardware, a solution to the biggest obstacle of the project is expected at the MCM presentation, and a full plan of how to implement the group's work into an African workshop is expected at the final presentation.

3) Resources

a) Monetary – The class has a materials budget of $2000. Teams will not have a fixed budget, as some teams will have to buy more things than others. If you would like to purchase an item you can either:
   i) Tell Amos where to buy it
   ii) Buy it yourself and submit your receipt to Amos for reimbursement

b) Manufacturing – The following manufacturing facilities will be accessible to WDDC students for their group projects:
   i) The Edgerton Shop (Room 44-023, Mark Belanger shop manager) – This shop is good for machining and cutting metal parts.
   ii) The Hobby Shop (Room W31-031, Ken Stone shop manager) – This shop is good for woodworking and has a waterjet.
   iii) The MIT Foundry (Room 4-010, Mike Tarkanian shop manager) – This shop is where to go to get things welded and learn to weld.

c) Parts – WDDC has multiple African-made wheelchairs and handcycles that teams can use. Teams should not destroy any of these devises, but are welcome to use parts from them. If a team would like to make a "permanent modification" to one of these devices, ask an instructor first. Also, there are loose bicycle components from all three partnering African countries which can be used/destroyed for prototyping.

d) Storage – Currently, class projects will be stored in room 3-446. The combination to the room is 5-3-4. Teams are to keep their projects consolidated in this room – do not make a mess! Do not leave valuables here, as the room is accessible to

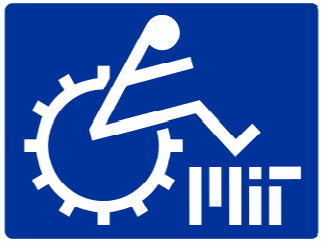
many people. The storage room may be changed during the semester, as a professor will be moving into this room at some point in the future.

e) People – Utilize your Mentors, Community Partners, and Lab Instructors to the fullest. They have a wealth of knowledge in your project area will greatly broaden the skill set of your team.

4) **Fellowships** – WDDC has funds to support three students this coming summer to implement technology generated in the class into African wheelchair workshops. The MIT Public Service Center (PSC) is interested in funding more fellowships focused on wheelchair work. Those who are interested will have to propose a project (most likely a continuation of their class project) within the guidelines of one of the PSC fellowships (Independent, Network, or Focus). To be fair to all interested students, proposals will be submitted to, judged by, and awarded through the PSC. Alison Hynd, coordinator for the fellowships and the IDEAS competition, will be coming to class on Feb 16 to talk about all funding opportunities to continue work from WDDC.

2007 Wheelchair Design in Developing Countries Syllabus

Week	Lecture date	Wheelchair topics	Presented theory	Guest lecturer	In-class activity	Assignments	Milestones
1	2/9/2007	Introduction to wheelchairs in developing countries	Developing country research		Wheelchair/Trike relay race around campus	Readings about wheelchair usage and distribution, Review projects	
2	2/16/2007	Designing wheelchairs for the developing world	Deterministic design process	Alison Hynd - PSC Fellowships	Choose project teams, watch video from workshops	Read 2.007 lecture notes on design process, define functional requirements of project, Reading from Nothing about us without us	
3	2/23/2007	Wheelchair Biomechanics/Ergonomics	Design for human use		Power output test up ramp in basement	Power calculations from class activity, reading from Positioning a Wheelchair, 3/1 - Encouraged to visit 2.007 lecture	
4	3/2/2007	Abdullah speaking to the class about his experiences	Round-Table Discussion	Abdullah Munish, TATCOT	Q&A with Abdullah	Reading from Independence through Mobility, 3/5-Encouraged to visit 2.007 lecture, 3/8-Encouraged to visit 2.007 lecture	Strategy presentations during lab period
5	3/9/2007	Appropriate Technology	Idea to product	Amy Smith, MIT	Wheelchair Roll-Play	Readings about different appropriate and inappropriate technologies	
6	3/16/2007	Available materials and manufacturing techniques in developing countries	Material science/ mechanics of materials	Prof. Mary Boyce, Mike Tarkanian, MIT	Exercise of calculating forces and moments	Reading from Mechanical principles of wheelchair design	
7	3/23/2007	Successful implementation of technology in developing countries	Investigation of successful products	Sarah Bird, Amy Banzaert, MIT	TBD	Reading from Mastering the Machine	Concept presentations during lab period
8	3/30/2007	Spring Break					
9	4/6/2007	Machine Design	Use of machine elements	Prof. David Gordon Wilson, MIT		Project work	
10	4/13/2007	Business plans in the developing world	Writing business plans	Jorge Barrera, MIT	TBD	Reading from Banker to the Poor	
11	4/20/2007	Ralf speaking to the class about his experiences	Round-Table Discussion	Ralf Hotchkiss, Whirlwind	Q&A with Ralf	Project Work	Most critical module (MCM) presentations during lab period
12	4/27/2007	Wheelchair user image	Product/ ergonomic design	Prof. David Wallace, MIT	Sketching Exercise and Judging	Reading on wheelchair user image	
13	5/4/2007	Project work	Project work			Project work	
14	5/11/2007	Project work	Project work			Project work	Poster for Museum of Science display on Sat, 5/12
15	5/18/2007	Project work	Project work			Project work	Final presentation of project with a working prototype during lab period



CLASS ACTIVITY
Cross-campus wheelchair relay

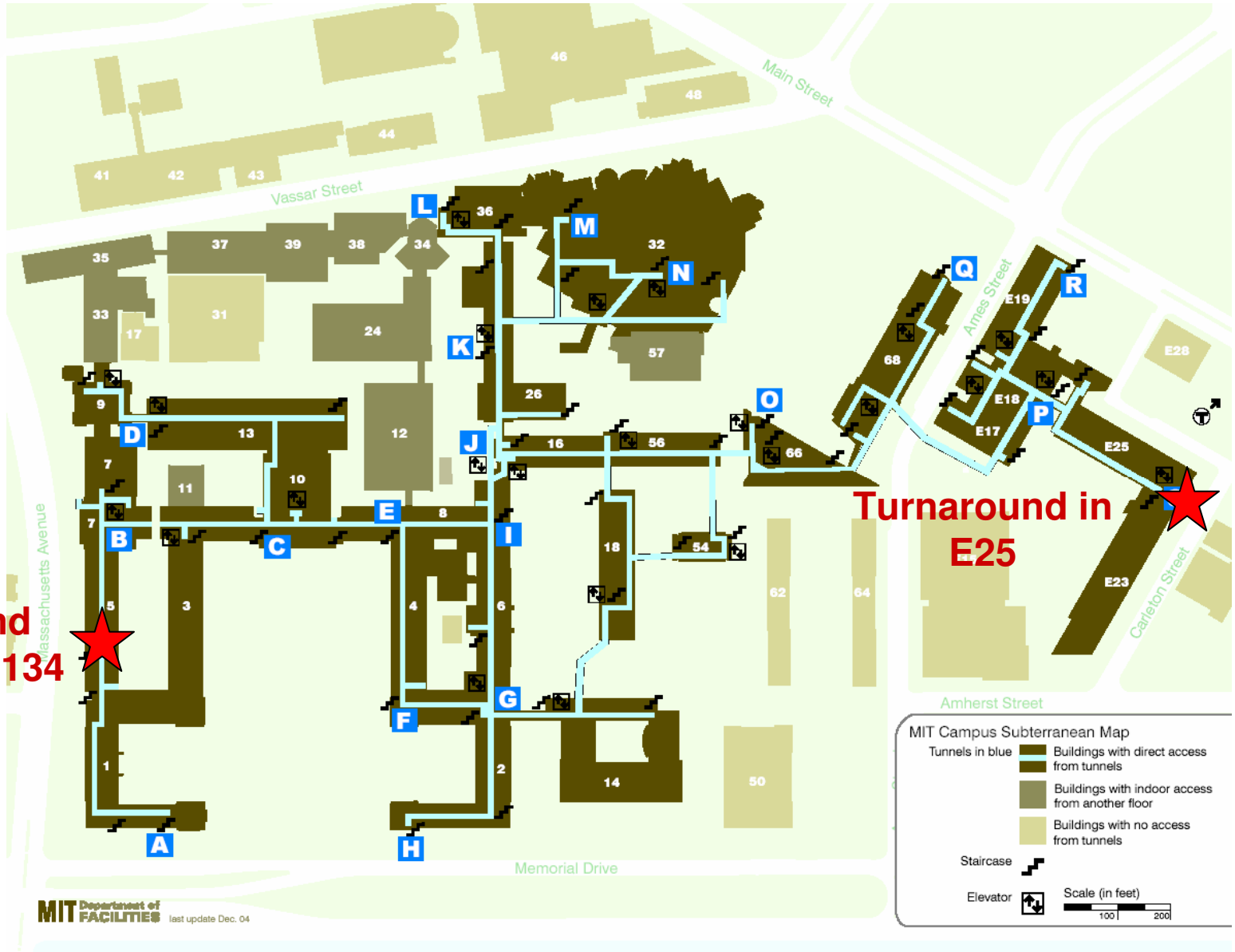
Objective: Understand the difficulties of using a mobility aid

Rules:

- Each team will be assigned a mobility aid
- The team has to travel from 5-134 to the basement of E25. The turnaround point is the base of the stairwell by MIT Medical, where some soda machines are located (see map)
- Teams will be released in 30second intervals from 5-134
- Each team must have a designated "rider" at all times
  - Rider does not have use of his/her legs
  - Rider can be carried or pushed
  - As a rider, only ask for help when you need it. Try to visualize what you would/would not be comfortable with if you were disabled
- Each team has to visit a bathroom and have their rider sit on a toilet for 30seconds (actually using the toilet is not required)
- A team can switch riders as many times as they want
- Each member of the team has to be the rider for a minimum of 3 minutes during the race
- Elevators cannot be used
- Teams must switch mobility aids at E25
  - The first team to arrive has to wait for the second team
  - The second team gives their mobility aid to the first team, and waits for the third team
  - The third team gives their mobility aid to the second team and receives the first team's original chair. They wait for the fourth team.
  - Process repeats through all teams until the last team receives the first team's original chair
- The team that returns back to 5-134 first gets to eat the first!
- Be respectful! This is not a joke. Be careful when you race so no one gets hurt.

February 9, 2007

CLASS ACTIVITY
MIT tunnel map



February 9, 2007