Fall | 10

# Grab-a-Bike @ Illinois

## LINC 298 Class – Sustainability full-proposal


Class Instructor: Dr. Bruce Litchfield

Current Project Manager: Mathieu Martel

# Course narrative

## Introduction to Linc298 – Grab-A-Bike

Grab-a-Bike Illinois aims to bring a bicycle-sharing program to the Champaign-Urbana campus and community. Grab-a-Bike distinguishes itself from any other program by being the first solar powered and cost efficient bike sharing system. Totally wireless, a terminal station can be installed anywhere - then unmounted and stored during hard winter months. Each component of the check-in station is selected to be extremely power-efficient, guaranteeing 24/7 operation with a single solar panel. This course, currently offered as ENG 298: Learning in the Community, presents an opportunity for the hands-on application of a number of skills. Computer science, mechanical engineering, and public relations, for example, are all areas that are represented. Currently the course is partnered with the Champaign-Urbana MTD and has an enrollment of 8 students with heightening interest. Our goal for the current semester is to build a working prototype and establish an organization in which students can participate in even after the course is over. With Grab-a-Bike we hope to establish a successful campus and community-based bicycle sharing system.

The program aims to serve both the university campus and the greater C-U community. Students who live both on and off campus will be able to use the system to get to and from classes and to do other daily activities. Ideally, there will be stations set up in both downtown Champaign and Urbana so that both students *and* members of the community will be able to use our system. On a broader scale and further into the future we are hoping this system can set a precedent for other universities and communities throughout the country and inspire them to create a similar program.

## The Linc class

The purpose of a Linc class is to make teams of students work on projects with and for non-profit, community partners. The projects address needs or problems that are important to the partner and provide significant opportunities for learning.

**Course Philosophy:**
Learning is an active process from the teacher's and from the learner's points of view. Teachers and students have a strong responsibility to one another.

**Objectives**:
Upon completion of this service-learning course, students can expect to improve their project skills and to contribute to important problems that benefit a nonprofit, community partner. Specifically, they should be able to:

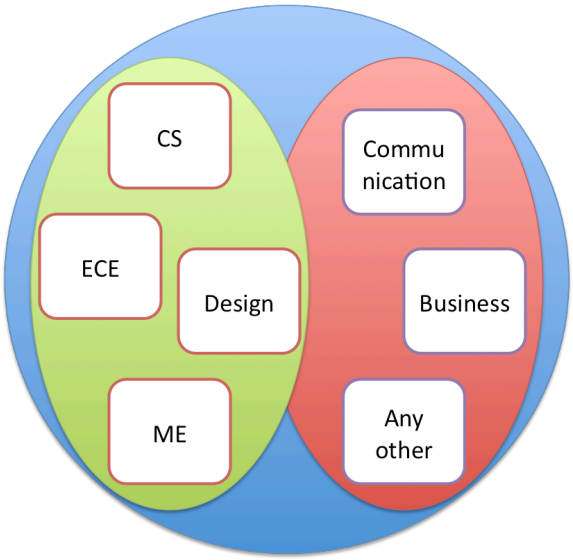
1. Understand their team, including their abilities and skills and how to use them in a project setting;

2. Understand their Partner deeply, be able to explain key issues and opportunities for the organization, and value and appreciate the partner and their mission;
3. Plan and implement a project for a client/partner;
4. Understand and apply project skills, including questioning, listening, defining a problem, team work, meeting skills, group problem solving (generating ideas, analyzing alternatives, decision making), taking responsibility, practicing leadership, dealing with adversity and conflict, and reporting and presenting your work;
5. Understand and be able to explain how they learn, particularly in the context of a problem-based team project performed for a client/partner;
6. Evaluate their work and work done by others; and
7. Appreciate the diversity of individuals in team project work.

## The Grab-A-Bike project

The team behind Grab-a-Bike is as diverse as it could get; of its 8 members, majors include computer science, mechanical and general engineering, industrial design, and international studies. They all share the same passion for bicycles and the vision of safer, less congested streets. There is great chemistry between the team members and with their large range of skills; they are well on their way to realizing a bike sharing system. Grab-A-Bike is a multi-disciplinary project organized like a start-up where technical and non-technical teams work together toward the same goal.

Even though some specific technical skills are needed to make some significant progress in the technical areas, any major can be beneficial to the group. A big part of the project concerns the promotion and requires some creative students with some very good communication skills.



Grab A Bike fields

## Power constraints

The mission of Grab-a-Bike is to reduce energy consumption within the Champaign-Urbana campus and community while promoting a healthy lifestyle and alternative mode of transportation. We plan to make our station not only portable but just reliant on solar power the solar panel is set-up, so that the lithium battery inside the UPS battery is charged throughout the daylight hours, which will be used as our main power source. We plan to use a 12v 7.2 Ah battery that lasts for about 120 hours of operation before it needs to be recharged. Since our bike station does not require an LCD screen, then we can do this and avoid large power consumption.

### Why would students enroll?

There are many courses that students can register in when enrolled in the LINC program. What makes the Grab-a-Bike course different and more interesting than the other Linc courses offers is a result of the uniqueness of the project that Grab-a-Bike focuses on. Since Grab-a-Bike is not partnered with a specific group, company, or organization there is a lot more freedom with the tasks, assignments, goals, and deadlines throughout the project. As of result of not having a partner helping out with the project, Grab-a-Bike has had to do a lot to make progress on the shared bike system. Students in Grab-a-Bike have to create business plans, write up grant proposals, meet with journalists, attend several promotional events, meet with potential sponsors, organize fund raising events, work with modeling software, and collaborate with community groups and university organizations that deal with the promotion a healthy lifestyle, conservation of the environment, to other bicycle related efforts. Grab-a-Bike is a course that really helps improve the students' leadership skills, networks, and provides the opportunity to apply technical knowledge. There is a variety of tasks in Grab-a-Bike that requires the skills of several majors. Grab-a-Bike is course that has a lot to offer, and with the diverse set of tasks required to create a working prototype of a shared bicycle system, there is a guarantee that anyone who signs up for this course will find something that peeks their interest.

## Course outline

### Brief

Since this course project based and more of a "grassroots" effort, there needs to be a student leader who possess a strong interest in the project and has good leadership skills. The leader will be enrolled in another class that will help develop the skills necessary to set guidelines and lead the group while allowing for collaboration on the idea. Students can enroll in the class to work in tandem with the project leader to execute the vision.

### Objectives and Timeline

This spring semester the Grab-A-Bike project has focused on building a V1 prototype and making the project grow up. For the Fall10 semester, the goal will to develop a V2 prototype.

The project will be decomposed into many steps, from the V1 prototype analysis to the creation of a new one based on the identified areas of improvement and the new prototype creation. This fall semester, the Grab-A-Bike team has built a development process and divided the team into 5 groups. Each of these groups had a timeline to follow during the semester and some deliverable to produce. This process/timeline proved to be efficient and can be used for the next semester as a guideline to develop the new prototype on the basis of the existing one.

The 5 groups are the following: Computer, Power, Design, Bikes, and Promotion.

For the Fall10 semester the group milestones would be the following (as a guideline):

Step 1: Existing prototype analysis
Deadline: 10/2010
Deliverable: Identified areas of improvement report

The 2 following steps (2 and 3) will aim to come up with both some technical developments in each of 5 technical fields and a significant measurable progress in the promotion.

Step 2: 1st technical progress review
Deadline: 11/01/2010
Deliverable: Written Progress report

Step 3: 2nd technical progress review
Deadline: 12/01/2010
Deliverable: Progress report with demo

Step 3: Final progress report
Deadline: 12/15/2010
Deliverable: A presentation to the Partner (MTD) with a prototype demo and a final report gathering all the technical specifications and improvement between V1 and V2 prototypes.

In addition to these deliverables students are required to write a weekly journal (200 words progress/personal experience analysis).

The location and time for this class is as follows Discussion: TR, 12:30-1:50, Credit: 3 semester credit hours

## Proposed budget

The budget to create a new station prototype will be $5500. However, considering the money we got from the RSO during the spring semester, only $5000 would be necessary from the committee.

| | | Expenses | Credits |
|---|---|---|---|
| **Terminal components (Mounted)** | Wireless connection (GSM and wifi modules) | 40 | |
| | Solar supply (Panels, regulator, Battery) | 150 | |
| | Relay Cards | 120 | |
| | I/O components for UI (Card reader, buttons, screen) | 75 | |
| | Identification system (iButton and 1-Wire) | 50 | |
| | ARM embedded computer | 720 | |
| | Latch locks | 100 | |
| | Cables, connectors | 100 | |
| **Steal/Enclosure (need for custom build).** | Lock racks | 1000 | |
| | Terminal box | 1000 | |
| | Solar support | 250 | |
| | On-bike locks | 125 | |
| **Bikes (5)** | Frame, Security components (vices), Lighting system | 1250 | |
| **Data storage connection** | Server, GSM provider data plans (T-Mobile rates) | 500 | |
| **Fundings** | | | 5000 |
| **Sp10 funds** | | | 1000 |
| | **Balance** | **5480** | **6000** |


## Course instructor approval letter

(see attached)

## Instructor's Vita

Bruce Litchfield's Resume: http://abe.illinois.edu/faculty/B_Litchfield

*Thank you for considering our application.*

*The Grab-A-Bike team*

I, Bruce Litchfield, Professor and Assistant Dean for the College of Engineering agree to oversee and advise ENG298: Grab-a-Bike in the Fall 2010.

Signed,

Bruce Litchfield on 3/12/10

Signature Date