**2013-2014 UC Berkeley Master of Engineering**

**Capstone Project Proposal**

**Overview:**

The Capstone Project, a 5-unit Maser of Engineering course requirement, integrates core leadership coursework with a student’s engineering concentration. Capstone Project teams range from three to ﬁve students, drawn from the cross-disciplinary engineering cohort, to apply diverse knowledge and skills to actual industry problems, identiﬁed by faculty or industry partners. The Fung Institute for Engineering Leadership within the College of Engineering provides capstone cohort support and curriculum integration.

**Capstone Sponsor Information:**

Please read the following instructions and requirements before submitting your proposal. In order to be considered, this document must be completed in full. By submitting this proposal, you agree to its inclusion in the *UC Berkeley Master of Engineering Capstone Project Portfolio* for the 2013-14 Academic Year. Use of links, diagrams and images to illustrate your project is encouraged. Example projects can be found here: <http://funginstitute.berkeley.edu/programs/capstone-projects>

**Timeline for submission and important deadlines:**

|  |  |  |
| --- | --- | --- |
| **Year** | **Dates** | **Activity** |
| **2013** | **March** | **Capstone Project Call for Proposals** |
|  | **By April 1** | Submit a one-sentence description of your project idea. |
|  | **By May 1** | **Full Project Proposals due**  Please use the proposal form supplied. |
|  | **May-July** | **Proposal Review –** screening for skill set and objective fit with incoming M.Eng. class**.** |
|  | **July-August** | **Student Project Exploration**  Industry advisors should be available for questions and interview screening of students during this time. |
|  | **August 12-31** | **Capstone Team Selection Process, Sponsor and Faculty office hours** |
|  | **September 1-12** | **Capstone Final Match:** Notification no later than Sept 12 |
|  | **Early December** | **Fall Student Poster Session** |
| **2014** | **Early May** | **Spring Student Poster Session** |
|  | **May 1-17** | **Final Student Presentations and Deliverables** to Industry & Faculty Advisors |

If selected for the 2013-2014 Capstone Project Portfolio you will be responsible for sponsoring and adhering to the terms you outline below. **As the Capstone Sponsor, please *initial* the following requirements by which you are agreeing to the following:**

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Provide a point person from your organization to advise the capstone team on a regular basis and throughout the whole duration of the project

Supply all necessary tools, software, and/or data necessary to do the project in a timely manner

Ensure the project has achievable deliverables that fit into a 9-month timeframe

Provide clear objectives for both the technical and business-related challenges of the

project

By signing below you are indicating that you completed this form to the best of your knowledge and are agreeing to all the requirements of UC Berkeley’s Capstone Project Program as listed above.

We look forward to working with you!

Name: Dan Fletcher Title: Professor, Bioengineering Dept.

Email: fletch@berkeley.edu Phone: 510-643-5624

Signature or Initials: DAF

Date: 5/1/13

*Questions?* Contact Beth Hoch hoch@berkeley.edu or 510-664-4587

**Proposal Form (please complete all sections):**

|  |  |
| --- | --- |
| **Project Title** | **Ocular CellScope: Diagnosing eye diseases with a mobile phone** |
| **Industry Partner**  Company Name, Department, and Website | Margolis Lab, UCSF Department of Ophthalmology (<http://ucsfeye.net/tmargolis.shtml>) |
| **Problem**  (Describe the industry problem your project addresses in 100 words or less.) | Approximately 314 million people worldwide are visually impaired, with 87% of this affected population residing in developing countries. Many of the diseases affecting these individuals could be easily diagnosed and treated if proper healthcare facilities existed to provide proper eye examinations for screening of these diseases. Surprisingly, these same developing regions often have strong cellular phone coverage, creating the potential to take advantage of this cellular phone network for telemedicine purposes. In the developed world, health problems such as diabetes are associated with eye problems including diabetic retinopathy. |
| **Technical Challenge**  (Highlight the technical challenge of the problem in 100 words or less) | We have recently demonstrated that mobile phones can be converted into microscopes with the ability to detect tuberculosis, malaria, and sickle cell anemia. We have also shown that they can be used to carry out physical exams of the ear and the skin. Our technology for examining the retina – necessary for diagnosing glaucoma, diabetic retinopathy, cytomegalovirus retinitis, retinopathy of prematurity, and other disease – has shown great promise but is in need of further development and testing. This project will incorporate recent feedback from clinical field testing in Thailand to develop an improved retinal imaging system. |
| **Objective**  (In 100 words or less, use bullet format and ensure objective is practical for a 9 month project) | Our specific goals for this project are:   * Modify the current optical system to include “fixation lights” which will direct the patient where to focus their gaze during imaging * Add infrared imaging lights (thereby avoiding the discomfort, blink reflex, and pupil constriction associated with white light) * Add the necessary control electronics to adjust the brightness of these lights from the iPhone user interface * Improve the ergonomics of the current system, including develop a technique for steadying the device during imaging to reduce motion blur * Testing the improved device on human subjects |
| **Project Illustration (Optional)**  Include websites, videos, diagrams or images to help students understand your project | CellScope project website:  <http://cellscope.berkeley.edu> |
| **Open or Closed Model – Please check one:**  Open Model (Public collaborative and may use university lab equipment) or Closed Model (Virtual internship, private, with faculty liaison)  \* Please list the necessary equipment, software or data that is needed and will be provided to the team. | Please select one and clearly outline what, if any, resources will be provided:  x Open Model/Public collaborative  **Tools and Equipment that will be provided include:**  Electronics and optical fabrication tools, 3D printer, laboratory microscopes  Closed Model/Virtual internship  **Tools and Equipment that will be provided include:** |
| **Ideal Team Size**  (We prefer teams of 4 students, unless otherwise specified) | 4 Students |
| **Departments Accepted**  (Choose from CEE, EECS, IEOR, ME, MSE, NE. Indicate ideal team makeup and technical concentrations desired, i.e.  “1 CEE ; 1 EECS; 2 IEOR”) | *Please indicate your ideal team makeup by specifying the technical concentrations desired.*  2 BIOE, 1 EECS, 1 IEOR |
| **Specific Skills Required**  (i.e. *C/C++/C#, Python ,CAD, Robot Kinematics, MATLAB, Excel Financial Modeling, etc.*)  The more detail provided here the better team match you will receive. | CAD, optics and microscopy experience, electronics prototyping, embedded systems, rapid prototyping, C++/Objective C/Java programming skills (iPhone or Android mobile app development a plus) |
| **Coursework**  (Indicate any recommended/required prerequisite/co-requisite classes) | Optics and microscopy, electric circuits, programming, embedded systems, ergonomics and human factors, industrial product design |
| **Industry Advisor(s)**  **Name, Email, Phone Number**  \*If this is a closed model an Industry Point Person from your organization is required for the duration of the project and must be available to advise the team on a regular basis and provide all necessary resources | Todd P. Margolis, MD, PhD  Professor of Ophthalmology, UCSF  [Todd.Margolis@ucsf.edu](mailto:Todd.Margolis@ucsf.edu)  415-502-0298 |
| **Faculty Advisor(s) or Academic Liaison**  **Name, Department, and Email**  \*If this is an open model the Faculty Advisor or Academic Liaison is the primary party responsible for the advising and guidance of the capstone team, including providing all the necessary resources | Daniel Fletcher, PhD, Bioengineering, [fletch@berkeley.edu](mailto:fletch@berkeley.edu)  Frankie Myers, PhD, Bioengineering, [fbm@berkeley.edu](mailto:fbm@berkeley.edu) |