



Summer Internship Program at the University of Wisconsin-Madison

Specialized Summer Program for:

Intern

Medecal Contact Information

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Dear Intern,

We are pleased to offer you the opportunity to participate in the Summer Internship program in the Medecal lab at the University of Wisconsin-Madison from June 8 – August 31, 2009. The internship will consist of 20 hours/week and involves the following:

1. Research Project: You will be assigned a research project currently pursued in the Medecal Lab requiring 12 –14 hours/week
2. Technical Training: You will be required to complete a hands-on technical training program requiring 1 – 2 hours/week
3. Health care Experience: You will be required to communicate with a physician in town or out-of-town to perform *Needs Finding* (problem identification) requiring 1 – 2 hours/week
4. Industry Experience: You will be required to participate in industry trips at medical device companies in and around Madison.
5. Outreach Experience You will be required to perform outreach activities during your internship. These would be consists of the following for 1 – 2 hours/week:

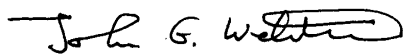
A. Medical Equipment Repair: You are expected to help nonprofit organizations in Madison (*Sharing Resources Worldwide* and *Hackett Hemwall Foundation*) by repairing medical equipment to be sent to developing countries.

B. Mentoring High School Students: You will be required to mentor high school students from traditionally under-represented groups, participating in an Engineering Summer Program at University of Wisconsin-Madison. These students will be working on projects involving developing low-cost technologies for developing countries.

We hope this summer internship will be an invaluable experience for your engineering career. Please feel free to contact us if you have any questions.

Sincerely

Professor John G. Webster



Sincerely

Amit J Nimunkar



Sincerely

Jonathan Baran



Research Project

Based on your research interests, we have identified the following research project for summer interns. The interns are expected to work 12 – 14 hours/week on the research project. The following is the research description of the project you would be working on:

Signal processing for the design of a USB based spirometer

In the spring 2009 semester an undergraduate BME design team started a project ‘Development of a Low-cost USB Spirometer’. Two out of the four members (Jeremy Glynn and Andrew Dias) of this design team will be continuing their work throughout the summer. They will be responsible for the hardware design as well as any multimedia videos to assist the user with the usability of their device. You will be working with this spirometer team. You will be responsible to:

1. Develop and implement the signal processing algorithms to analyze and process the data acquired from the prototype.
2. Research the necessary diagnostic measurements to obtain from the spirograms.
3. Once determined diagnostic parameters are determined, these must be programmed into an existing JAVA framework. Thus a working knowledge of JAVA programming language would be required for the integration of the parameters into the framework.

Please refer to the following webpages to recent developments on this project:

http://homepages.cae.wisc.edu/~bme300/spirometer_s09/

<http://openspirometry.org/>

Please see attached documents:

1. ATS Standardization of Spirometry

Each summer intern is also expected to write article for publication in a conference or a journal based on their research work during the internship.

Technical Training

The Technical Training module is designed to provide the summer interns with hands-on training in areas such as electrical/electronics, programming (LabVIEW, CAD and microcontroller), machining and fabrication to help them succeed with their design projects.

The interns are required to complete one training exercise for 1 – 2 hours/ week for the duration of their internship program. Training sessions will be chosen from the BME Design Supplemental Training Program, BME 310 labs and BME 462 labs.

The training exercises from the BME Design Supplemental Training Program consist of the following; please refer to the following website for more information

(<http://ecow.engr.wisc.edu/cgi-bin/get/bme/200/webster/7.suppleme/>):

Supplemental Training
Introduction to the basics of electrical and electronics measurements
SolidWorks training
Introduction to LabVIEW programming
Advanced LabVIEW programming
Introduction to soldering and medical equipment repair
Introduction to digital logic
Advanced electronics
Microcontroller Programming

The BME 310 Introduction to Biomedical Instrumentation lab exercises serve as an introduction to medical devices, and sensors for clinical and research measurements. The BME 310 lab exercises consist of the following, please refer to the following website for more information (<http://ecow.engr.wisc.edu/cgi-bin/get/bme/310/webster/bmelabexpe/>):

BME 310 Labs
Basic op amps and LabVIEW
Basic Circuit Design
Digital Signal Processing
ECG Circuit Design
Pressure Measurement and Ultrasonic Flow Measurement
Pulse Oximetry
Spirometry
Temperature measurements
Blood pressure measurements using impedance measurements

BME 462 Medical Instrumentation course is the advanced bioinstrumentation class for biomedical/electrical engineers. The BME 462 lab exercises consists of the following, please refer to the following website for more information (<http://ecow.engr.wisc.edu/cgi-bin/get/bme/462/webster/laboratori/>):

BME 462 Labs
Amplifier Assembly
Cochlear Implant Design
Perception of current and impedance measurements
Photoplethysmography
Inductance plethysmography
Radiotelemetry
Nerve Velocity
Electrical Safety

Healthcare Experience

The Healthcare Experience will provide the interns an opportunity to closely interact with physicians in Madison or out of town to identify their needs in a clinical setting. Needs finding (problem identification) will be a crucial part of the internship experience. The interns will be responsible for regularly meeting with doctors in the clinical setting and identifying problems with the current clinical procedures. Most of the doctors will be based locally in the Madison area. Communication with doctors in developing countries is also encouraged.

The interns are required to maintain a journal entry of their communication with the physicians and their needs in a clinical setting. This process will serve as a reflection, but will also serve as a guide to how to complete their respective design projects. As a part of the healthcare experience, at the end of the internship the interns need to submit a report describing 2 – 3 potential projects they identify based on the needs of the physicians in a clinical setting.

Industry Experience

The summer interns are required to participate in an Industry Experience program in which they will go on a field trip to mostly medical device companies in and around Madison. During these visits

the intern will be introduced to how medical devices proceed from conception to development to a commercial reality.

Some of the companies which the Medecal lab is planning on arrange field trips include:

Industry Field Trips
General Electric Healthcare (Madison, Milwaukee)
SpaceLabs Burdick Inc (Deerfield)
Abbott Labs (Chicago)
Tomotherapy (Madison)
Rockwell Automation (Milwaukee)
Nestle (Eau Claire)
Bit7 (Madison)

Outreach Experience

As a part of the summer internship the interns have to participate in Outreach Experience through which the interns will give back to the community, 1 – 2 hours/week through the following:

Medical Equipment Repair

The Medecal lab works closely with the Engineering World Health (EWH) – Madison Chapter, who goal is delivery of medical expertise and equipment to underserved nations. Please refer to their webpage for more information (<http://www.engr.wisc.edu/studentorgs/ewh/>). The EWH – Madison Chapter helps other non-profit organizations around Madison, Sharing Resources Worldwide (<http://www.sharingresourcesworldwide.org/>) and Hackett Hemwall Foundation (www.hacketthemwall.org/) by repairing medical equipment and operation manuals in different languages to be sent to developing countries. The interns will be required to participate in the repair of some of these medical equipments and the writing of the equipment operations manual.

Mentoring High School Students

The Engineering Summer Program (ESP) at the University of Wisconsin-Madison is geared towards high school students from traditionally under-represented groups to provide them better understanding of the field of engineering and its disciplines. Please refer to the following webpage for more information (<http://studentservices.engr.wisc.edu/diversity/esp/>). The ESP students will

be working on projects involving developing low-cost technologies for developing countries. As interns working on similar projects, you are expected to mentor and provide guidance to these students with their projects.