NSERC Summer Projects

NSERC summer projects are available for students interested in Biomedical sensors or Microfabrication applications. Depending on the students' there may be more than one student per project. Students selected for these projects will receive a NSERC funding of $5625. 5 students working on these projects have gone on to win NSERC graduate scholarships, partially based on their summer project work..

Please apply to Liz Munt (munt@sfu.ca) at the Co-op office and quote these NSERC job numbers, or Glenn Chapman, ASB 8831, phone 778-782-3814, Fax 778-782-4951, email glennc@cs.sfu.ca
Visit my web site for more about the type of research that is being done at
http://www.ensc.sfu.ca/people/faculty/chapman/

NSERC Summer Project 1
Advancing Micromachining by using lasers to turn Metal Transparent

With Prof. Glenn Chapman (ENSC)

Interested in the areas of microfabrication (how computer chips are made), micromachining and lasers? Our group, on a CREO sponsored project, has developed a new process where we can write with a laser on a special metal layer and turn it transparent. This is used to make photomasks, which create the patterns used in integrated circuits (think of them are really big film negatives). Furthermore the amount transparency depends on the laser power allowing us to create gray-scale masks (mask where we can create patterns of varying transparency just like a film negative). These are used to create 3 dimensional micromachined structures, for example microlenses. These masks are already the best direct write photomasks currently ever created. Our goal is to bring them to the commercial levels that CREO needs. This project will be done in with the help of graduate students already working in this area. Previous summer students have also been part of published conference papers on these results (including one that won a best paper award at the SPIE Photomask conference), and the project can be expanded into a BASc thesis. 40% of the students working on NSERC summer projects in this group have gone on to win NSERC graduate scholarships, in part aided by their research.

Depending on the student's background this project would range from: build microstructures with the masks, learning how to make the material more transparent, improving our mask writing system.

(1) Build 3D microstructures with the masks
(2) Experiments on how to make the grayscale materials more transparent and with finer grayscale levels.
(3) Improving our laser mask writing system (this would be more software orientated).

Skills Needed:

Student should be in third year or above. Some combination of the following skills are needed, but not all are required (i.e. if you have all but 460 or 495 that is fine). The skill set will determine the type of project. If you at taking the courses below in spring 2008 that is fine.

(1) Taken ENSC 495/851 (for students wanting to build devices)
(2) Taken an Optics courses from physics or Photonics & Laser Applications in Engineering (ENSC 460) (for making and designing more complicated optical systems.)
(3) Good in C programming (for the laser mask system work)
(4) Material science or Eng. Physics (for helping with the material improvement).
(5) Good computer skills, Spreadsheets & Matlab very helpful.

NSERC Summer Project 2
Helping Improve Digital Camera Sensors

With Prof. Glenn Chapman (ENSC)

Are you interested in digital photography or optical sensors? We are exploring ways of ways of improving the digital sensors used in these systems, called CMOS Sensors or Active Pixel Sensors. There 2 areas we are working on: the identification of defects as cameras age, and the testing of new sensor designs.. As the sizes digital camera sensors become larger both in pixel count and area, the possibility of pixel defects increases during manufacturing, and over the lifetime of the sensor. People do not want to throw away expensive cameras just because they have dead pixels in it, but find such dead spots annoying in pictures. We are exploring ways of correcting this using fault tolerant pixels and pixel defect identification using from the pictures camera users take. In addition we have developed several new pixel designs that offer new characteristics e.g. higher sensitivity or larger dynamic range. Previous students have also been part of published conference papers on these results and part of it has resulted in a patent application. Previous summer students have also been part of published conference papers on these results (including one that won a best paper award at the SPIE Electronic Imaging conference), and the project can be expanded into a BASc thesis. 40% of the students working on NSERC summer projects in this group have gone on to win NSERC graduate scholarships, in part aided by their research.

Depending on the student's background this project would range from:

(1) Software simulations of algorithms for detecting defects in imagers. This work is already been started so it would be done in cooperation with a graduate student.
(2) Experimental testing of already fabricated chips with new Active Pixel Sensor designs. This includes both optical, and electronic measurements
(3) Software simulation of new methods of extracting colour information for digital imagers.

Skills Needed:

Student should be in third year or above. Some combination of the following skills are needed, but not all are required (i.e. if you have all but 460 or 450 that is fine). The skill set will determine the type of project. If you at taking these courses below in spring 2008 that is fine.

(1) Background in digital photography. use of adobe photoshop, or digital raw files etc very helpful.
(2) Taken an Optics courses from physics or Photonics & Laser Applications in Eng Sci. (ENSC 460) (for making and designing more complicated optical systems.)
(3) Good in C programming (for the measurement systems work and data analysis).
(4) An advantage if you have taken VLSI Design ENSC 450 (but not a requirement).

NSERC Summer Project 3
Using a Micromachined Optical device designed to see through Tissue

With Prof. Glenn Chapman (ENSC)

Are you interested in biomedical, micromachining, or lasers and looking for a summer NSERC project that will give you practical experience in research? Then consider a project with the BORG: Biomedical Optical Research Group, which combines a micromachined device with an optical system and a CMOS camera to build a system that can see through tissue (eg. skin). Light can penetrate quite deeply into tissue but much of it becomes heavily scattered. To illustrate this effect place a flash light behind your hands in the dark and see the resulting red glow which penetrates, but the very poor definition of the bones within the hand. The key to successful optical imaging is the separation of the slightly scattered light, which carries information about the structure of the tissue through which it passes, from the scattered component that is Billions of times greater. We have built some micromachined optical devices that are already seeing though the equivalent of 10 mm of tissue. Where would this be used? Since light does not damage tissue like X-rays do it can be used to replace X-ray screening in such areas as mammograms, brain scans etc. That is what the target of this work is: to test the micromachined and optical systems we have built on simulated tissue and see if we can reach the needed sensitivity for such applications (do not worry – we do not use real tissue). Previous graduate and NSERC students have helped develop an automated system for the first set of measurements (5 student have done thesis on the experiments we have done). Previous students have also been part of published conference papers at the BIOS Biomedical Imaging and Optics Systems conference on these results as well as extending this to a BASc. thesis. 40% of the students working on NSERC summer projects in this group have gone on to win NSERC graduate scholarships, in part aided by their research. This summer project will extend this to observation of more complex investigation of real tissue with diode laser sources of different wavelengths and object structures, plus a improved optical and measurement system.

Depending on the student's background this project would range from:

(1) Measurements on structures simulating tissue
(2) Building new micromachined devices with some measurements on them
(3) Combining optical systems with the micromachined devices to create even greater sensitivity systems.
(4) Computer analysis/simulation of images (we already have a simple simulation program running

Skills Needed:

Student need to be in third year or above. Some combination of the following skills are needed, but not all are required (i.e. if you have all but 460 or 495 that is fine). The skill set will determine the type of project. If you are taking the 460 or 495 courses in the spring 2008 hat is fine.

(1) Good computer skills, Spreadsheets & Matlab (Adobe Photoshop an advantage but not necessary as you can learn that).
(2) Taken an Optics courses from physics or Photonics & Laser Applications (ENSC 460) in Eng Sci. (for making and designing more complicated optical systems.)
(3) Good in C programming (for simulation work)
(4) Biomedical option programs.
(5) Taken ENSC 495/851 (for students wanting to help build devices)