Objective:
For this project, I will be working in Dr. tissue engineering lab to study tumor angiogenesis. Angiogenesis is the formation of new blood vessels and it is a critical component of tumor metastasis. Cancer metastasis decreases the chance of survival in cancer patients and occurs in almost all lethal cases of cancer. Understanding the metastatic potential of cancer tumors is thus important in assessing their risk. Developing a cost-effective method to characterize cancer tumors could prove to be a useful tool in deciding what treatment strategy is the most promising for a specific type of cancer. The primary objective of this project will be to develop microfluidic technology for characterizing cancer tumors in terms of how aggressive they are and whether they stimulate angiogenesis.

Synopsis: Initially, the work will begin with literature research concerning tumor angiogenesis and how it is related to metastasis. This research will be performed to learn how to optimize growing conditions for tumors in the vicinity of vasculature within a microfluidic device in vitro. The majority of the work for the semester will consist of designing and carrying out experiments with my research mentor involving tumor and vascular tissue formation. These types of tissue will be created in microfluidic devices made up of the polymer Polydimethylsiloxane (PDMS). The specific microfluidic device that will be used has three separate chambers that cells and components of extracellular matrix can be seeded into. Using these multi-chamber devices, I will create tumor tissue and vascular tissue in separate chambers and observe how cancer tissue growing in one chamber of the device will affect the development of microvessels in the other chamber. In particular I will investigate: how well the cancer cells survive in the device and how cancer cells affect the vessel growth, direction of migration of vessels, vessel density, and vessel size. Data from these experiments will be primarily acquired using an optical microscope to obtain bright field or fluorescent microscopy images of the tissue in the device.

Time: I plan to work about 12 hours every week for a total of 180 hours over the semester on this project.

Justification of Credits: I am requesting 3 course credits and 3 engineering topic units for this independent study project based on the amount of time I plan to work.

Budget: The budget for this project will be covered by current research grants being used by the Lab.

Final Outcome: The final outcome of the project will be full documentation of all experiments in a laboratory notebook consisting of: hypotheses, procedures, data,
and conclusions. Additionally a 2-3 page written report will be created describing the significance of this research, summarizing the work from the semester, and suggesting future steps for this research.

**Grade:** The grade to be assigned for this project will be based on: the thoroughness of the written reports in the laboratory notebook, fulfillment of all required time, and the quality of the final written report.