

Research Topics

This page provides outline descriptions of (ENGEN582/Masters/PhD) research topics that I currently have available.

A 900-level (PhD) project typically requires about 7000 hours, typically 3 and a half years full-time, or 7 years half-time. An ME project (500-level) will take about 2000 hours, and must be completed in one calendar year. A Capstone project (400-level) requires 450 hours. A Special Topic project (equivalent to a 300-level) typically requires 150 hours. An internship project demands 10 to 12 working weeks, or about 400 hours.

Projects do not come with any stipend or salary unless specifically stated otherwise.

Last updated 8/26/2019, 12:12:42 PM

- **Fractional-capacitor Battery Model**

This is a 900-level (PhD) topic. A research masters is required. Experience with python/C, unix, and instrument control would be advantages.

Tentatively assigned to Sinduja Seshadri

Recent work has suggested that rechargeable batteries can be modelled in their linear regions (20 to 80% SoC) using fractional capacitors (also known as Constant Phase Elements or CPEs) rather than voltage or current sources. This project will look at extending our passive battery model to the full-charge and near-flat regions. The intention is to achieve this with memristors modelling the depletion of chemical species. The outcome will likely be a fully-passive, nonlinear, equivalent-circuit battery model. The aim will be to predict state-of-charge, terminal voltage response to an arbitrary load, and cycle efficiency.

- **Audio Frequency Power Meter**

This could be a 500-level (45-point Honours) investigation or a Special Topics project.

The aim of this project is to build a power meter that measures real and reactive power in the audio frequency range. The expectation is to design a version of an ETI-138 Audio Power Meter (Nov 1978) using an AD633 multiplier from Analog Devices.

- **SPICE Model of a BC547**

This could be a 500-level (45-point Honours) investigation or a 500-level (Masters) project.

The BC547 has been around a long time. A detailed SPICE model has been available for over 40 years, but the values do not seem to be consistent over time. This is likely to be a result of changes in the silicon fab technology. This project aims to obtain values on a single transistor for the majority of the SPICE parameters. A point of interest will be comparing them with values obtained in the 1970s.

- **Vacuum-tube Characterisation System**

This could be a 500-level (45-point Honours) investigation or a Masters project,

The task is to assemble two programmable power supplies into a system for characterising vacuum triodes, and then measure some tube characteristics with a view to testing various available models on precise, modern data. The task is to control the system with a small controller, such as a Raspberry Pi, using USB and RS232 interfaces, and deliver compact data files.