Final Year Project – Design and Development of an Electrocardiogram (ECG) Monitor

Supervisor – Dr. Jean-Michel Redouté

Number of Students: 1

If you are interested in this project, please email me your name, ID number and an online copy of your course academic transcript.

This project will suit students with an interest in biomedical circuit / embedded system design.

Background:

The BICS group develops devices (biosensors) to form a wireless sensor network system that has the capability to monitor physiological parameters from patient bodies by means of different communication standards. These include both implanted and on-body nodes. Wireless electrocardiogram monitoring is rapidly becoming a common method of monitoring.

Goal: The goal of this project is to design and develop an electrocardiogram monitor for continuous on-body monitoring. The scope of the work is the design, development and characterization of an analog front end (AFE) circuit. Depending on the progress made, the readout may be expanded to the development of a wireless, wearable system.

Milestones:

1. Formalization of hardware / software architecture, specifications and time plan.
2. Design (Schematic and Layout) is complete.
3. Manufacturing and Testing of Prototype is complete and according to specifications (Number of iterations depends on the student). Functional testing includes gain bandwidth, noise, power consumption, as well as acquisition of signal from a person / ecg simulator.
4. Documentation is complete.

Timetable: Milestones 1-2 should be completed by the end of the semester 1.
Number of Students: 1

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This project will suit students with an interest in biomedical circuit / embedded system design.

Background:

The BICS group develops devices (biosensors) to form a wireless sensor network system that has the capability to monitor physiological parameters from patient bodies by means of different communication standards. These include both implanted and on-body nodes. Pulse oximeters are ubiquitous in hospital healthcare and are becoming an integral part of wearable devices for on-the-go healthcare monitoring.

Goal: The goal of this project is to design and develop a pulse oximeter monitor for continuous on-body monitoring. The scope of the work is the design, development and characterization of an analog front end (AFE) circuit from a commercial pulse oximeter probe. Depending on the progress made, the readout may be expanded to the development of a wireless, wearable system.

Milestones:

1. Formalization of hardware / software architecture, specifications and time plan.
2. Design (Schematic and Layout) is complete.
3. Manufacturing and Testing of Prototype is complete and according to specifications (Number of iterations depends on the student). Functional testing includes gain bandwidth, noise, power consumption, as well as acquisition of signal from a person’s finger.
4. Documentation is complete.

Timetable: Milestones 1-2 should be completed by the end of the semester 1.
Final year project - Design of a High Power High Frequency Filter for TV Broadcasting

Supervisors: Dr. Jean-Michel Redouté, Mr. Dieter Pelz (RFS)

Number of students: 1

If you are interested in this project, email me your name, ID number and an online copy of your course academic transcript.

This project will suit students with interest and aptitude in RF electronics and electromagnetics.

Wireless systems use various radio frequency ranges: all of these systems incorporate various types of filters as essential parts for spectrum control and for signal routing. Radio and television broadcasting requires high power, and correspondingly, high power filters: although the latter designs are based on the same concepts as low power filters, they cannot be realized using discrete capacitors and inductors as the power requirement is too high. Rather, they are designed based on the use of physically distributed element resonators, which are essentially constructed as TEM-mode quarterwave resonators. The required poles and zeros in the filter transfer function are therefore realized by carefully adjusting the shape, dimensions and construction of these resonators and their couplings, rather than by varying L and C component values. By adding more resonators, a larger filter order is obtained. The TEM-mode resonators and their couplings are designed using 3D electromagnetic simulation software packages. An initial design of the required coupling values and resonator Q-factors can be performed entirely in the mathematical domain.

This project will target the design of a multi resonator high-power filter for use at TV broadcasting frequencies.

The milestones of this project are:

1) Conduct a survey of papers regarding multi-resonator filters. What has been achieved so far?
2) Design a n-th order multi-resonator filter using CST for the physical design.
3) Manufacture the filter.
4) Measure and test the filter.

Timetable: By the end of semester one parts 1 and 2 need to be completed.