ELEC40002

Analysis and Design of Circuits

- Explain the basic physics underlying the operation of the following electronic components: resistor, capacitor, inductor, diode, transistor
- Perform DC analysis of circuits containing combinations of the above components, using small-signal equivalent models to linearise any non-linear elements
- Perform AC analysis of circuits containing combinations of the above components, using simplified circuits including amplifier stages and logic gates
- Apply the operation of simple transistor level circuits including amplifier stages and logic gates
- Analyse basic opamp circuits containing idealised opamps and passive components
- Apply the concept of a transfer function and derive the transfer functions for a range of standard filter circuits
- Analyse the transient behaviour of 1st order RC and RL networks
- Use SPICE to simulate the behaviour of the circuits you have studied
- Appreciate where and how the circuits you have studied are applied in real engineering applications

ELEC40003

Digital Electronics and Computer Architecture

- design significant synchronous sequential digital circuits using registers and combinational logic
- design simple two's complement addition and subtraction digital circuits, with correct use of carry and overflow
- use digital blocks: RAMs, ROMs, registers, adders, multiplexers and demultiplexers to design and analyse the operation of simple pipelined RISC computer systems
- model the operation of machine code instructions on a CPU at register transfer level, and manipulate data using different numeric representations
- write programs for arithmetic operations, manipulating bit fields within words, accessing memory, and calling subroutines
- implement I/O in embedded computer systems using polling

ELEC40004

Programming for Engineers

- use the fundamental components of imperative programming in terms of control-flow structures and variables
- design and implement a C++ program that communicates using file-based I/O in a CLI environment
- verify the correct behaviour of programs
- diagnose and fix incorrect behaviour and crashes
- select and use data-structures from the STL according to needed performance and functionality
- use APIs, encapsulation, and abstraction to manage software complexity
- design object-oriented data-structures to capture real-world problems

ELEC40006

Electronics Design Project

- Capture and analyse a set of high-level requirements to produce a set of design specifications
- Apply theoretical principles and laboratory skills to design, build and test a solution to an engineering design problem, within practical constraints
- Integrate analogue, digital and software theory and design techniques into a functioning system
- Organise workload and manage time by functioning as an engineering team and decomposing the design challenge into subsystems
- Formulate and implement a test plan to evaluate a design against its specifications
- Communicate process and outcomes to stakeholders using various forms of communication (reports, presentations, reviews, etc.)

ELEC40009

Topics in Electrical Engineering

- Describe waves as information carriers
- Describe how waves propagate in free space and transmission lines
- Apply mathematical tools to investigate signals in the frequency domain
- Explain the need for modulation techniques to facilitate signal and identify the basic hardware components to achieve modulation and demodulation
- Describe the transport processes in a pn diode and extrapolate this knowledge to its use as a solar cell
- Employ laboratory skills to characterise solar cells
- Illustrate how solar polar is transported from the source to the household
- Relate the different engineering topics to demonstrate how they are interconnected