EE4.18 RF Electronics: Course Summary

Organisation

Instructor	:	Christos Papavassiliou
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class place	:	Room EE 407a
class time	:	Tuesday 4pm-6pm

Objectives

At the end of this course, the student should be able to:

- Calculate radio, microwave and radar link power and noise budgets.
- Design narrowband LC and distributed matching networks
- Implement lumped and distributed microwave filters.
- Design microwave transistor amplifiers and be able to optimise them for Gain, port matching and noise figure.
- Design microwave transistor oscillators and mixers.
- Interpret and manipulate network analyser measurements.

Prerequisites

I expect fluency in the material of 1st and 2nd year electronics courses:

- Introductory electronics.
- Statement of the Thevenin and Norton Theorems.
- Single Stage Transistor amplifier design, both with Bipolar Junction Transistors (BJTs) and Field Effect Transistors (FETs). Frequency response.
- Small signal and large signal one port parameters. Impedance - Admittance.

The material in the 3rd year Electronics Course: "High Performance Analogue Integrated Circuits" course is helpful, but not formally required.

Workload-Appraisal

The course will be taught in 2 hours of lecture per week for one term. There will be a scheduled weekly hour to provide help with problem solving.
Exercises quoted in the handouts are intended to be study guides and are optional. I cannot stress too much, however, that doing these exercises is the most effective way of learning the course material.
I will supply a formula sheet with the final examination.

Books, Notes, Equipment

I will follow the notes distributed in class, which together with classroom notes taken by you should be be adequate study guides.

A good book to assist in revision is by T. Lee (Planar Microwave Engineering, Cambridge U. Press). A book which explains things well but is also too qualitative is by Hagen (Radio-Frequency Electronics: Circuits and Applications , Cambridge University Press). A cheap book containing a lot of practical microwave engineering, especially on impedance matching, filter design (which as we will see is the same thing!), and the use of the Smith Chart (which remains useful half a century after being superseded by computer programs!) is by C. Bowick (RF Circuit Design, Newnes Press) . Finally, if you are curious to see how all this relates to Microwave Monolithic Integrated Circuit Technology, our very own Dr Lucyszyn has edited an excellent review ("RFIC and MMIC design and Technology", IET press).

Transistor amplifier design, and other tedious calculations, can be greatly accelerated by using Microwave Office, a very powerful -and rather easy to use- microwave CAD package you will find on the departmental Teaching computers (thanks to a license donation to College by its publishers).