15 Feb 2008

ENEL 434: Electronics 2 – 2008

Course Objective:

To study and analyse the circuits and devices used in radio-frequency communication systems.

Lectures: Wednesdays, 9:00am normally A309
Thursdays, 3:10pm normally E10

Instructors:

Prof. Peter Gough (Course Administrator)
(Room A306, Ext. 6297, email: peter.gough@canterbury.ac.nz)
Dr. Kim Eccleston
(Room A314, Ext. 7045, email: kim.eccleston@canterbury.ac.nz)

Office Hours: By appointment only.

Course Homepage: w:courses/ENEL434

Recommended Text: available from the bookstore.

- D. M. Pozar, *Microwave Engineering*, 3rd Ed., John Wiley, 2005.
  ISBN: 0-471-44878-8

Coursework and Assessment:

Your final grade in this course is comprised of the following:

Description	Due Date	% of Total Grade	Associated Instructor(s)
Test 1	27th March	10%	PTG
Test 2	28th May	10%	PTG
Assignment	16th Oct.*	25%	KE
Final		55%	Both

* Assignment involves design of a UHF amplifier and there are necessarily intermediate due dates for PCB layout and assembled circuit.

Date	Lect. No.	Title	Scope
		Lectures by Professor Peter Gough	
27 February	1	Course introduction	•
28 February	2	Small Signal amplifiers	• High frequency, narrow band
5 March	3	Biasing	• Coupling, gain, ss amplifiers
6 March	4	Tuned load amplifiers	• Resonant loads, bandwidth, gain
12 March	5	Tuned load amplifiers con't	• Performance prediction & simulation
13 March	6	Impedance matching	• Coupling into complex sources and loads
19 March	7	Parallel and series tuned circuits	• Parallel/series transformations
20 March	8	Transmission lines	• Characteristic impedance
26 March	9	Smith charts	• High frequency design tool
27 March	10	**Test**	• 50 minutes. (Lectures 1 to 8)
2 April	11	S parameters	• How to use them and what they mean.
3 April	12	UHF transistors	•
		END OF TERM 1	

		Lectures by Professor Peter Gough	
30 April	13	Complex impedance matching	• With lumped components and transmission lines
1 May	14	Microstrip amplifier design	• Single and double stub matching
7 May	15	Microstrip amplifier design con't	• Full amplifier design with biasing and stubs
8 May	16	Microstrip amplifier design con't	• Review of design techniques
14 May	17	Oscillators	• Colpitts, Hartly, Phase shift
15 May	18	Colpitts design details	• Design walk through
21 May	19	Analogue filter design	• Filter characteristics
22 May	20	Butterworth, Chebeychev, Bessel	• Modern design (with mention of classical method)
28 May	21	**Test**	• 50 minutes (Lectures 9 to 18)
29 May	22	Frequency and impedance transforms	• LP prototype to LP, HP BP and BS
4 June	23	Active filter design	• MFB, VCVS
5 June	24	Active filters con't	• Realizations
		END OF TERM 2	

Lectures by Dr Kim Eccleston			
16 July	25	Assignment introduction	• Overview of amplifier design
17 July	26	Assignment introduction	• UHF circuit techniques
23 July	27	Assignment introduction	• Microwave Office: circuit simulation tool
24 July	28	RF Receiver Architecture	• Image suppression and double conversion
30 July	29	Assignment introduction	• Microwave Office: layout
31 July	30	RF Receiver architecture	• Homodyne and other receiver architectures
6 Aug	31	Noise in electronic circuits	• Review of random processes
7 Aug	32	Noise in electronic circuits	• Sources of noise
13 Aug	33	Noise in electronic circuits	• Basic circuit analysis for noise
14 Aug	34	Noise in electronic circuits	• Low noise amplifiers
20 Aug	35	Noise in electronic circuits	• Specialised op-amps and instrument amplifiers
21 Aug	36	Noise in electronic circuits	• Specifying ADCs and noise control
END OF TERM 3			

Lectures by Dr Kim Eccleston			
10 Sept	37	Noise in RF circuits and systems	• Noise descriptions for RF circuits
11 Sept	38	Noise in RF circuits and systems	• Noise figure of a two-port network
17 Sept	39	Noise in RF circuits and systems	• Noise figure of a multistage RF system
18 Sept	40	Noise in RF circuits and systems	• RF LNA design example
24 Sept	41	Noise in RF circuits and systems	• RF system design examples
25 Sept	42	Nonlinearity in RF circuits and systems	• Non-linear phenomena
3 Oct	43	Nonlinearity in RF circuits and systems	• Single tone excitation
4 Oct	44	Nonlinearity in RF circuits and systems	• Two-tome and multitone excitation
8 Oct	45	Nonlinearity in RF circuits and systems	• Large signal and small signal excitation
9 Oct	46	Nonlinearity in RF circuits and systems	• RF power amplifier behaviours
15 Oct	47	Nonlinearity in RF circuits and systems	• RF mixer behaviour
17 Oct	48	Nonlinearity in RF circuits and systems	• Examples
END OF TERM 4			