

*EE 322 Electronics II –
Wireless Communication Electronics*

Lecture Notes

Keith W. Whites
Spring 2006



Laboratory for Applied Electromagnetics and Communications
Department of Electrical and Computer Engineering
South Dakota School of Mines and Technology

Course Notes:
EE 322 *Electronics II – Wireless Communication Electronics*

Table of Contents

Lecture	Title
1	Overview. NorCal 40A. Direct conversion vs. superhet receivers.
2	Resistors, capacitors, RC networks. Arbitrary waveform generator.
3	Diodes. Amplitude modulation. Diode detection.
4	RL circuits. Inductive kick. Diode snubbers.
5	RC filters. Series resonance and quality factor. Matching. Soldering.
6	Parallel resonance and quality factor. Transmit filter.
7	Transmission lines. Distributed C and L . Telegrapher's equations.
8	Time-domain solutions to TL wave equations. Reflections.
9	Phasor waves on TLs. Terminations. Input impedance. Resonance.
10	Available power. Lossy TLs. Quality factor of TL resonators.
11	Ladder filters. Butterworth and Chebyshev filters. Filter tables. <i>ADS</i> .
12	Bandpass ladder filters. Quartz crystals.
13	Impedance inverter. Cohn crystal filter.
14	Transformers. Ideal transformers.
15	Transformer shunt inductance. Tuned transformers.
16	Bipolar junction transistors. Large signal models.
17	Transistor switches. Voltage regulators.
18	Common emitter amplifier. Max. efficiency of class A amps. Transformer coupled loads.
19	Available power. Distortion. Emitter degeneration. Miller effect.
20	Emitter follower and differential amplifiers.
21	Junction field effect transistors. Source follower amplifier.
22	Class C power amplifiers.
23	NorCal 40A power amplifier. Thermal modeling.
24	Oscillators. Clapp oscillator. VFO startup.
25	Variable frequency oscillator. Gain limiting.
26	Receiver incremental tuning. Crystal oscillators.
27	Mixers. Gilbert cell.
28	Superheterodyne receivers. Spurious responses of mixers.
29	Decreasing channel bandwidth by using CW. Key clicks.
30	Audio amplifiers.
31	JFETs as variable resistors.
32	Automatic gain control.
33	Noise, SNR, MDS, noise power density and NEP.
34	Nyquist noise formula. Cascading noisy components. Noise figure.
35	Receiver intermodulation and dynamic range.
36	Antenna impedance. EM waves. Transmitting and receiving antennas.
37	Friis formula. Reciprocity. Dipole and whip antennas.
38	Ionosphere. Radio waves. Critical and maximum useable frequencies.