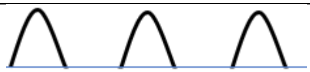
Zero to Advanced Formula Sheet

Lesson 1	$I = \frac{E}{R}$ **Ohm's Law**			
Lesson 2	$V = \frac{J}{Q}$ $A = \frac{Q}{t}$ $W = \frac{J}{t}$ $R = \frac{E}{I}$ **Derived Units**	$P = IE = I^2R = \frac{E^2}{R}$ **Electric Power**	W = J x t 1 kWh = 3.6 MJ **Electric Energy**	
Lesson 3	$Rt = R1 + R2 + R3 \dots n$ **Resistors In Series**	$\frac{1}{Rt} = \frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3} \dots n$ **Resistors In Parallel**	Better Be Ready Or Your Great Big Venture Goes West **Resistor Colour Code**	
Lesson 4	The sum of all currents entering and exiting a node must equal zero. **Kirchoff Current Law (KCL)**	All voltages across components in a loop must equal the sum of the input voltage. **Kirchoff Voltage Law (KVL)**	Current into a node + Current out of a node – **Nodal Analysis**	
Lesson 5	Right hand for generators. Left hand for motors. **Fleming's Rules**	$E_{int} = E_{Peak} Sin\theta^0$ **Instantaneous value**	$V_{rms} = V_{peak} \times 0.707$ **Root Mean Square value**	Av = 0.637 x Peak **Average value**
	$\lambda = c/f$ **Frequency Wavelength**	$Period = \frac{1}{Freq}$ **Frequency Period**	$c = 300\ x10^6$ m/s **Speed of Light**	$\frac{V_P}{V_S} = \frac{I_S}{I_P} = \frac{N_P}{N_S} = \sqrt{\frac{Z_P}{Z_S}}$ **Transformers**
Lesson 6	C=εr ε0 A / d **Capacitor** ε0 = 8.854x10-12 F/m	Q = C x E **Capacitor Charge**	$W = \frac{E^2 x\ C}{2}$ **Capacitor Energy**	$\frac{1}{Ct} = \frac{1}{C1} + \frac{1}{C2} + \frac{1}{C3} \dots n$ **Capacitors In Series**
	$Ct = C1 + C2 + C3 \dots n$ **Capacitors In Parallel**	$H = \frac{0.4\ x\ \pi\ x\ N\ x\ I}{\varepsilon}$ **Inductor**	$W = \frac{I^2\ x\ L}{2}$ **Energy in Inductor**	$Lt = L1 + L2 + L3 \dots n$ **Inductors In Series**

	$\frac{1}{Lt} = \frac{1}{L1} + \frac{1}{L2} + \frac{1}{L3} \dots n$ **Inductors In Parallel**			
Lesson 7	$T = CR = \frac{L}{R}$ **RC RL Time Constant**	$X_l = 2\pi f L$ **Inductive Reactance**	$X_c = \frac{1}{2\pi f C}$ **Capacitive Reactance**	$f_r = \frac{1}{2\pi\sqrt{LC}}$ **Tuned Circuit Freq**
	$Q = \frac{2\pi f L}{R} = \frac{1}{2\pi f C R}$ **Q of tuned Circuit**	$BW = \frac{f_{Resonant}}{Q}$ **Tuned Circuit Band Width**	$Z = \sqrt{R^2 + (X_L - X_C)^2}$ **Impedance**	
Lesson 8	$Power\ Gain = 10Log_{10} \times \frac{P_1}{P_2}$ **Power Gain dB**	$Voltage\ Gain = 20Log_{10} \times \frac{E_1}{E_2}$ **Voltage Gain dB**	$\beta = \frac{\Delta I_c}{\Delta I_b}$ **Transistor Beta Gain**	$\alpha = \frac{\Delta I_C}{\Delta I_E}$ **Transistor Alpha Gain**
	$\mu = \frac{\Delta E_b}{\Delta E_e}$ **Valve Gain**			
Lesson 9	 E Peak = 1.4 x E RMS E AV = 0.45 x E RMS E PRV = 1.4 to 2.8 E RMS Ripple = 50 Hz **Half Wave**	 E Peak = 1.4 x E RMS E AV = 0.9 x E RMS E PRV = 2.8 E RMS Ripple = 100 Hz **Full Wave**	 E Peak = 1.4 x E RMS E AV = 0.9 x E RMS E PRV = 1.4 x E RMS Ripple = 100 Hz **Bridge**	$C = \frac{I\ x\ t}{E}$ **Filter Capacitor**
Lesson 10	$E_n = \sqrt{4\ x\ K\ x\ T\ x\ R\ x\ BW}$ K = 1.381×10^{-23} **Thermal Noise**	$Image = signal + (2 \times IF)$ **Superheterodyne Image**		
Lesson 11	$m = \frac{\Delta f}{f_s}$ **FM Modulation Index**	$BW = 2(\Delta_f + f_s)$ **FM Band Width** (Carson's Rule)	$m = \frac{M}{A}$ **AM Modulation Index**	

Lesson 12	$Z_O = \sqrt{(Z_{SC} \; x \; Z_{OC})}$ **Impedance Matching**	$VSWR = \frac{V_{max}}{V_{min}}$ **VSWR**	$VSWR = \frac{V_{fwd} + V_{ref}}{V_{fwd} - V_{ref}}$ **VSWR**	$SWR = \frac{1 + \sqrt{\frac{P_{ref}}{P_{fwd}}}}{1 - \sqrt{\frac{P_{ref}}{P_{fwd}}}}$ **Standing Wave Ratio Power**
	$\frac{N_P}{N_S} = \sqrt{\frac{Z_P}{Z_S}}$ **Balun**			
Lesson 13	$ERP = power \; x \; gain \; (linear)$ **Effective Radiated Power**	EIRP = 1.64 x ERP **EIRP Watts**	EIRP = ERP + 2.15dB **EIRP dB**	
Lesson 14	$SNR = 10Log \frac{Signal \; Power}{Noise \; Power}$ **Signal to Noise ratio**	$SNR = 20Log \frac{Signal \; Voltage}{Noise \; Voltage}$ **Signal to Noise ratio**		