ECE764 Spring 2019 Parts

PER PERSON PARTS:

Qty	Description	Part # and vendor
1	M-BNC crimp connector for RG174, Amphenol 31-315-RFX	(Digikey ARFX1049-ND) $2.35
1	Minicircuits LEE-39+ 8 GHz low noise Amplifier	(Minicircuits LEE-39+) 1.35
1	Minicircuits Gali-1 InGaP HBT 8 GHz microwave Amplifier	(Minicircuits Gali-1+) 1.15
4	F-SMA pcb-mount connectors suitable for 62 mil board edge mount	(Digikey CON-SMA-EDGE-S-ND) 8.40
1	Voucher for PCB fab (used during project)	$50

Per Student Cost $70

TEAM PARTS: (Not used till later in semester)

Additional parts for 5.8 GHz doppler/FMCW radar design *

4	Hirose U.FL surface-mount ultra-mini coax connector	(Digikey H9161CT-ND) $5.24
1	Maxim 1.9 - 2.3 GHz VCO	(Digikey MAX2752EUA+) $2.17
2	Skyworks SMS7621-005LF dual RF Schottky diode (SOT-23)	(Digikey 863-1118-1-ND) $2.62
1	3X Frequency multiplier (5.4 - 9 GHz out)	(Minicircuits RMK-3-93+) 13.95
1	2.8 - 8.5 GHz mixer, with high LO-RF isolation	(Minicircuits MCA1-85L+) 9.45
2	DC - 8 GHz 10 dB gain InGaP HBT 8 GHz microwave Amplifier	(Minicircuits Gali-1+) 2.30
2	DC - 8 GHz 14 dB gain InGaP HBT 8 GHz microwave Amplifier	(Minicircuits Gali-2+) 2.30
2	DC - 8 GHz 12 dB gain Amplifier	(Minicircuits LEE-19+) 2.70
2	DC - 8 GHz high-gain, low-noise Amplifier	(Minicircuits LEE-39+) 2.70
2	LMV822 low-voltage dual opamp SOIC-8	(Digikey LMV822MXCT-ND) KSU residual
1	LMV751 low-noise opamp SOT23-5	(Digikey LMV751M5CT-ND) KSU residual
1	10.0 MHz, 3.3V TCXO (Abricon ASTX-H11-10.000MHz-T	(Digikey 535-12042-1-ND) 3.23
1	2.8 GHz PLL synthesizer, National Semi LMX2326	(Obsolete) KSU residual
2	3.3V, 150 mA regulator in SOT23-5 package (Microchip TC1185)	(Digikey TC11853.3VCT713CT-ND) 0.76
2	5V, 1A regulator in SOT223 package (Diodes Inc, ZLDO1117)	(Digikey ZLDO1117G50DICT-ND) 1.00
2	10uF tantalum capacitors 16V SMD	KSU residual
1	3.35mm (1/8") stereo headphone jack	(Digikey CP-43516SJGRCT-ND) 1.24
1	Teensy LC (Arduino compatible board with DAC and ADC)	(PJRC Teensy-LC) 11.65
1	10 segment LED light-bar display KWL-R1025VB (red)	(Adafruit 1921) 1.75
1	10 element 330 Ohm resistor array, 11 pin SIP	(Digikey 4611X-101-331LF-ND) 0.72

Per Student Cost $20

* Radars will be designed by teams/companies of 4 students. Quantites listed are sufficient to build one radar. Additional parts may be left over from the team - and/or additional parts may be purchased to build additional copies of the final product design if desired.

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In addition, the following items will be provided free of charge and/or available in the lab (in limited quantity):

1	18” wood rod 3/8” diameter for dipole for antenna build in Lab 2	(Home depot)	
3	Plastic tie wraps for antenna build in Lab 2	(Home depot)	KSU stock
-	Copper solid-core 12 gauge wire for antenna rod elements in Lab 2	(Home depot)	KSU stock
2	Safety “caps” to put on ends of antenna rods		
1	KSU-designed amplifier prototype PCB for Lab 3 (for testing Gali-1 / LEE-39 amps and familiarization with PCBs)		
1	1-sided 62-mil PC board - 4 x 4 or 3 x 5 inches for filters/matching-network design in Lab 3		
-	RG174 coax (Digikey 473-1000-ND) for antenna build in Lab 2	(Home depot)	KSU stock
-	1/4” wide copper tape for filters/matching-network design in Lab 3	(Digikey 3M1181A-ND)	KSU stock

-	3.9 and 18 nH 0603 SMD inductors	(Ebay or Digikey)	KSU stock
-	Ferrite beads 0603	(Ebay or Digikey)	KSU stock
-	Wire (various gauge/colors)	(Digikey)	KSU stock
-	0.1” header pins and jumpers		
-	Solder, etc...		

PCB Fabrication:

PC board fabrications will be needed in the project work. These will be done through ExpressPCB at $41 per board (plus shipping).

A “voucher” worth up to $50 toward fabrication cost is included when you purchase your parts. This can fund up to one board per student of a 2-layer board design which allows for up to 4 boards for a team of 4 students. That should be sufficient for up to two revs of a 2-board radar.

Alternatively, a confident team may elect to use the vouchers to fund two 4-layer boards (one rev only).

Additional board-spins will be at your own expense - although it is doubtful there will be enough time for that, so be careful and double-check your designs and layouts before you submit them ! (Have your team review them in a “Critical design review”)

See the following page for information on available discrete resistor and capacitor components

Available Resistor/Capacitor Values

Surface Mount Components

The Communication Circuits Lab maintains a stock of "0805" and “0603” surface mount resistors and capacitors. These components are 0.08" x 0.05" and 0.06” x 0.03” respectively, so that their parasitics (series inductance and shunt capacitance) are reasonably small at low GHz frequencies. Note that commercial products often use 0402, 0201, or even smaller parts to make the end product compact and to operate up to Ku band and above (> 10 GHz). These are generally too difficult for construction in our environment.

Component values available

For resistors, we have values from about 10 Ohms to 1 MOhm (In E12 series increments. 10, 12, 15, 18, 22, etc.)

IMPORTANT: We do NOT stock 1% and other resistors with silly values like 123.4 Ohms. We only have the E12 series noted above. Please don’t design for or ask for exact values. ***Think, and only use the precision you need.*** Google for the EIA definition of the E12 series.

For capacitors, the range is about 0.5pF to 0.1uF. Values below 10pF may not follow the standard 10% (E12) value spacing. Instead they are 0.5, 1.0, 1.5, 2, 3, 4, 5, 6, 7, 8, and 9pF.

For those needing higher than 0.1uF, there is also a limited quantity of 1uF value available.

Component tolerances and ratings:

The tolerance on resistors is generally 5%, and their power dissipation is about 1/10 watt.

The voltage rating for the surface mount capacitors we stock is generally 50 VDC, and the tolerance is 5% for the NPO types between 10 pF and 1000 pF and 10% for X7R types that span the range from 1200pF to 0.1uF.

Small valued caps in the range of 6 pF to 10 pF have tolerances of +- 0.5pF, while caps below 6pF have tolerance of +-0.25pF.

BUT ! Recall that components have parasitics and **the effective value may be affected by inductance in PCB traces**. This is especially true for medium to large value capacitors at high frequency...

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