

project COMPLETE kit

- Shipping will depend on the quantity purchased, and the estimates below may be more or less than what you actually pay.
- When determining quantity, don't forget to add a kit for the instructor and purchase extras for loss and failure.
- Numbers shaded in **blue** below require more than you will need for one kit; in many cases, you will want to purchase more than the minimum to provide extras and because of steep price breaks as quantity increases.
- Substitutes are available for most of the parts below; other electronics suppliers include Newark Electronics and Jameco Electronics (in addition to those listed below).

| item | supplier | part # | packaging | price per package | cost shipping per pkg | quantity per kit | per kit actual cost |
|--|----------------------|-----------------|-----------|-------------------|-----------------------|------------------|---------------------|
| Tools and Associated Items | | | | | | | |
| multimeter: Innova 3320 Auto-Ranging | J&B Tool | EPI3320 | 1 | \$ 23.13 | \$ 0.50 | 1 | \$ 23.63 |
| fuse (315 mA, 250V, 5mmx20mm) - for Equus 3320 multimeter | digikey | 507-1697-ND | 1 | \$ 0.24 | \$ 0.10 | 1 | \$ 0.34 |
| multimeter leads w clips (TL12 IC clip/banana leads from Elenco) | omnitron electronics | TL-12 | 1 | \$ 4.99 | \$ 0.25 | 1 | \$ 5.24 |
| wire stripper: Pololu 20-30 AWG solid | pololu | 1923 | 1 | \$ 6.95 | \$ 0.25 | 1 | \$ 7.20 |
| double-ended screwdriver (phillips & flat) | ideastage.com | 135379319 | 1 | \$ 1.28 | \$ 0.25 | 1 | \$ 1.53 |
| Needle Nose Pliers (Long Nose Plier) | kole imports | ML034 | 1 | \$ 1.49 | \$ 0.50 | 1 | \$ 1.99 |
| thermometer: 4 3/4" instant read digital pocket probe thermometer | WebrestaurantStore | 913300NSFB | 1 | \$ 6.50 | \$ - | 1 | \$ 6.50 |
| Controller & Platform | | | | | | | |
| arduino UNO Rev3 | RobotShop | RB-Ard-112 | 1 | \$ 20.75 | \$ 1.00 | 1 | \$ 21.75 |
| power supply; 9VDC; wall wart; 2A; 2.1mm x 5mm barrel jack | jameco | 2225609 | 1 | \$ 12.20 | \$ 1.00 | 1 | \$ 13.20 |
| breadboard; 400 point; 3.25" x 2.125" | jameco | 2157693 | 1 | \$ 4.49 | \$ 0.25 | 1 | \$ 4.74 |
| acrylic sheet; clear; laser cut at LA Tech; 1/4" x 24" x 48" sheet; cut to 3.5" x 4.732" | lowes | 11288 | 1 | \$ 66.98 | \$ - | 0.02 | \$ 1.44 |
| standoffs; 1/4" OD; 1/2" long; nylon; 4-40 thread; female-female | fastersuperstore | 254797 | 1000 | \$ 196.79 | \$ 5.62 | 2 | \$ 0.40 |
| screws; 4-40; 1/4" long; zinc plated | mcmaster-carr | 90272A106 | 100 | \$ 1.50 | \$ 0.50 | 2 | \$ 0.04 |
| screws; 4-40; 1/2" long; zinc plated | mcmaster-carr | 90272A110 | 100 | \$ 1.80 | \$ 0.50 | 2 | \$ 0.05 |
| Fan Parts | | | | | | | |
| motor; 12VDC; 11000 RPM | mpja | 18298 MD | 1 | \$ 0.99 | \$ 0.20 | 1 | \$ 1.19 |
| propeller/fan: EUDAX, 2mm shaft diameter, 4 vanes, 80mm fan diameter | amazon | EUDAX micro DC | 32 | \$ 7.98 | \$ 2.00 | 0.031 | \$ 0.31 |
| big shrink wrap (1" x 4' black; part number DWP-125-1-0-STK (1.25"/kit) | digikey | Q2F100B-ND | 48 | \$ 3.10 | \$ 0.50 | 0.026 | \$ 0.09 |
| Circuit Elements | | | | | | | |
| photoresistor: 16-33Kohm (0.5Mohm dark, 16 to 33 kohm @ 10 Lux) | digikey | PDV-P8103-ND | 1 | \$ 0.89 | \$ 0.25 | 1 | \$ 1.14 |
| thermistor: Cantherm; 10kohm; -5C to 125C | digikey | 317-1258-ND | 1 | \$ 0.43 | \$ 0.25 | 1 | \$ 0.68 |
| potentiometer; 3/8" square; 10 kΩ, 1/2-W; 0.1" lead spacing; single turn w shaft | jameco | 2118791 | 1 | \$ 1.39 | \$ 0.25 | 1 | \$ 1.64 |
| SPST-NO Relay, 3A contact, coil=5V, coil=40mA | digikey | PB370-ND | 1 | \$ 2.39 | \$ 0.25 | 1 | \$ 2.64 |
| Transistor, NPN, 40V, 200mA max, tape&reel, package TO-92 | digikey | 2N3904D26ZTR-ND | 2000 | \$ 76.31 | \$ 10.00 | 2 | \$ 0.09 |
| diode gen perpose 100V 1A D041 | digikey | 1N4007DICT-ND | 1 | \$ 0.19 | \$ 0.25 | 4 | \$ 1.76 |
| switches; pushbutton for breadboard; set of 12; 6 colors | sparkfun | com-10302 | 12 | \$ 5.85 | \$ 0.50 | 2 | \$ 1.06 |
| switches; mini slide; 3-pin (3-pack) | pololu | 1408 | 3 | \$ 1.25 | \$ 0.25 | 1 | \$ 0.50 |
| LEDs; red; 5mm; diffused (100 packs) | mpja.com | 15108 OP | 100 | \$ 1.95 | \$ 1.50 | 5 | \$ 0.17 |
| LEDs; yellow; 5mm; diffused (100 packs) | mpja.com | 15309 OP | 100 | \$ 1.95 | \$ 1.50 | 5 | \$ 0.17 |
| LEDs; green; 5mm; diffused (100 packs) | mpja.com | 15308 OP | 100 | \$ 1.95 | \$ 1.50 | 5 | \$ 0.17 |
| LEDs, RGB Color 4 lead | mpja.com | 35702 OP | 50 | \$ 2.95 | \$ 1.50 | 2 | \$ 0.18 |
| 220 Ω carbon film resistor (0.6 mm dia. Lead wires, 1/4 watt) | digikey | 220QBK-ND | 1000 | \$ 11.44 | \$ 1.50 | 10 | \$ 0.13 |
| 470 Ω carbon film resistor (0.6 mm dia. Lead wires, 1/4 watt) | digikey | 470QBK-ND | 1000 | \$ 11.33 | \$ 1.50 | 5 | \$ 0.06 |
| 1 kΩ carbon film resistor (0.6 mm dia. Lead wires, 1/4 watt) | digikey | 1.0KQBK-ND | 1000 | \$ 11.33 | \$ 1.50 | 5 | \$ 0.06 |
| 10 kΩ carbon film resistor (0.6 mm dia. Lead wires, 1/4 watt) | digikey | 10KQBK-ND | 1000 | \$ 11.33 | \$ 1.50 | 5 | \$ 0.06 |
| 0.1uF capacitor (ceramic) | digikey | 399-4331-ND | 1 | \$ 0.25 | \$ 0.10 | 2 | \$ 0.70 |
| 10uF capacitor | digikey | 493-1144-ND | 1 | \$ 0.26 | \$ 0.10 | 2 | \$ 0.72 |

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|--|--------------------------|---|------|-----------|---------|---------------|------------------|
| 100uF capacitor | digikey | 493-1061-ND | 1 | \$ 0.26 | \$ 0.10 | 4 | \$ 1.44 |
| 100 mH inductors (can add in series) | digikey | RLB1014-104KL-ND | 1 | \$ 0.48 | \$ 0.10 | 3 | \$ 1.74 |
| Heater Parts and Thermistor Waterproofing | | | | | | | |
| 10 Ω power film resistor, 15W; used as electric heater | digikey | MP915-10.0F-ND | 1 | \$ 3.92 | \$ 0.25 | 1 | \$ 4.17 |
| 3/32" polyolefin heat shrink tubing (2:1 shrink ratio) - self extinguishing; red (put 1" on) | digikey | FP332R-500-ND | 500 | \$ 133.04 | \$ 5.00 | 1 | \$ 0.28 |
| 3/8" polyolefin heat shrink tubing (2:1 shrink ratio) - self extinguishing; blue (7" needed) | digikey | FP038B-200-ND | 200 | \$ 94.08 | \$ 5.00 | 0.583 | \$ 0.29 |
| 3/16" heat shrink tubing (2:1 shrink ratio); to waterproof thermistor (7" length) | digikey | F2213/16BK161-ND | 100 | \$ 9.43 | \$ 1.00 | 0.583 | \$ 0.06 |
| Jumpers & Wire (you don't have to get all the wire colors below) | | | | | | | |
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| jumper wire set: 140-piece; 22 gage, various colors and lengths | mpja.com | 27027 TE | 1 | \$ 3.95 | \$ 0.50 | 1 | |
| wire: 1000'; red | omnitron electronics | KSM2201-2-1000 | 1000 | \$ 44.99 | \$ 8.00 | 3 | |
| wire: 1000'; black | omnitron electronics | KSM2201-0-1000 | 1000 | \$ 44.99 | \$ 8.00 | 3 | \$ 0.16 |
| wire: 1000'; green | omnitron electronics | KSM2201-5-1000 | 1000 | \$ 44.99 | \$ 8.00 | 3 | \$ 0.16 |
| wire: 1000'; blue | omnitron electronics | KSM2201-6-1000 | 1000 | \$ 44.99 | \$ 8.00 | 3 | \$ 0.16 |
| wire: 1000'; violet | omnitron electronics | KSM2201-7-1000 | 1000 | \$ 44.99 | \$ 8.00 | 3 | \$ 0.16 |
| wire: 1000'; yellow | omnitron electronics | KSM2201-4-1000 | 1000 | \$ 44.99 | \$ 8.00 | 3 | \$ 0.16 |
| wire: 1000'; white (use for the heater); 3 feet | omnitron electronics | KSM2201-9-1000 | 1000 | \$ 44.99 | \$ 8.00 | 3 | \$ 0.16 |
| wire: 1000'; orange (use for the thermistor); 3 feet | omnitron electronics | KSM2201-3-1000 | 1000 | \$ 44.99 | \$ 8.00 | 3 | \$ 0.16 |
| Bags & Containers (quantities depend on whether you store electronic parts in bags or in the 5-compartment box) | | | | | | | |
| 3" x 5" x 4 mil white block poly bags (case of 1000) | usplastic | 48802 | 1000 | \$ 22.02 | \$ 5.00 | 5 | \$ 0.14 |
| 5" x 8" x 4 mil white block poly bags (case of 1000) | usplastic | 48804 | 1000 | \$ 47.62 | \$ 8.00 | 2 | \$ 0.11 |
| 5-compartment box; 6 1/2" x 3 3/4" x 1 1/8" (for electrical components) | zoro | G3375458 | 1 | \$ 3.26 | \$ 0.25 | 1 | \$ 3.51 |
| plastic shoe box; sterlite; 6 quart; 13.63"x8.25"x4.88" (12 pack) | walmart | 577055845 | 12 | \$ 32.10 | \$ 3.00 | 1 | \$ 2.93 |
| Safety Glasses (choose one or the other depending on needs) | | | | | | | |
| Radians Chief OTG Safety Eyewear (Clear) - for students that wear eyeglasses | www.safetyglassesusa.com | 360-C | 1 | \$ 1.59 | \$ 0.25 | 1 | \$ 1.84 |
| Pyramex Intruder Safety Glasses with Clear Uncoated Lens | www.safetyglassesusa.com | S4110SUC | 1 | \$ 0.99 | \$ 0.25 | 1 | \$ 1.24 |
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| | | | | | | Total: | \$ 119.20 |
| Sous Vide (1 per classroom) | | | | | | | |
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| Sous Vide Cookers | amazon | https://www.amazon.co | 1 | \$ 26.39 | | | |

| notes | identified substitutes |
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| purchase one extra per class; they are very reliable other than the fuses burning out | Tools ID: Equus® 3320 - Innova™ Auto-Ranging Digital Multimeter |
| purchase 1 extra per student | Summit Racing Equipment: Innova 3320 Series Auto-Ranging Digital Multimeters 3320 |
| purchase one extra per 10 students; fix by straightening hook, reinserting it, rebending hook | |
| \$5.56 if you buy 50; purchase just for loss or in case you need to add a student | Wholesale Sock Deals: SKU:868495 |
| order without imprint for low quantities, purchase 1 extra per 10 students for loss | |
| purchase 1 extra per 10 students for loss | Wholesale Sock Deals: SKU:385637 |
| purchase 1 extra per class | Webstaurant Store: Item #: 6083516 |
| | |
| purchase a couple of extras per class to account for part failure | |
| \$11.10 if you buy 10 | |
| \$3.25 if you buy 100 | |
| | |
| can purchase at mcmaster.com (\$1.47 each); part number: 92319A873; get 1 extra per 2 students | |
| purchase 1 extra bag | |
| purchase 1 extra bag | |
| | |
| get a couple of extras | |
| get a couple of extras (if 32 is not already enough) | |
| purchase 1 foot extra per 20 students | |
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| \$0.46 if you buy 100; purchase 1 extra per student | |
| \$0.23 if you buy 100; purchase 1 extra per student | |
| \$1.09 if you buy 100; purchase 1 extra for every 2 students | |
| \$1.79 if you buy 100; purchase 1 extra for every 2 students | |
| lifetime supply :-) | |
| \$0.0722 if you buy 100; purchase 2 extra per student | |
| \$5.27 if you buy 100 packs; purchase 1 extra per student | |
| | |
| \$0.97 if you buy 100 packs; purchase 1 extra pack per 6 students | Amazon: Uxcell a12013100ux0116 High Knob 3P 2 Position 1P2T SPDT Vertical Slide Switch, 0.5 Amp, 50V DC, 50 Piece, 3 mm |
| purchase an extra pack of 100 | |
| purchase an extra pack of 100 | |
| purchase an extra pack of 100 | |
| purchase an extra pack of 50 | |
| can buy 100 for \$2.60 total; get twice as many as you think you'll need | |
| can buy 100 for \$2.60 total; get twice as many as you think you'll need | |
| can buy 100 for \$2.60 total; get twice as many as you think you'll need | |
| can buy 100 for \$2.60 total; get twice as many as you think you'll need | |
| \$0.0874 if you buy 100; purchase 1 extra per student | |
| 0.09910 if you buy 100; purchase 1 extra per student | |

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| \$0.09910 if you buy 100; purchase 1 extra per student | |
| \$0.30 if you buy 100; purchase 1 extra per 2 students | |
| | |
| \$2.59 if you buy 100; purchase 1 extra for every 2 students | |
| purchase at least 10 feet more than you'll need | |
| purchase at least 10 feet more than you'll need | |
| purchase at least 10 feet more than you'll need | |
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| purchase 1 extra per 10 students | Amazon: AUSTOR 840 Pieces Preformed Breadboard Jumper Wire Kit 14 Lengths Assorted Jumper Wire for Breadboard Prototyping Solder Circuits |
| purchase one roll | Amazon: REXQualis 840 Pieces Breadboard Jumper Wire Kit with 14 Lengths Assorted Jumper Wire for Breadboard Prototyping Solder Circuits |
| purchase one roll | |
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| | Amazon: Sterilite 16428012 6 Quart/5.7 Liter Storage Box, White Lid with Clear Base (Pack of 12) |
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| Estimated cost per kit; average kit cost will depend on the number of extra parts purchased and on the quantity of each item purchased, considering shipping and volume discounts | |
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| | Amazon: Nuovovare Sous Vide Cooker, IPX7 waterproof Precise Cooker Immersion Circulator, 1000W, LCD Display, Touch Control, Timer for Healthy Cooking - Black |
| | Amazon: Nuovovare Sous Vide Cooker, 1000W IPX7 waterproof Precise Cooker Immersion Circulator with LCD Display, Touch Control, Timer for Healthy Cooking - Black |
| | Amazon: Nuovovare Sous Vide Accurate Temperature Digital Timer, Precision Cooker, 1000Watts - Black |