TEACH SPIN

Instruments Designed for Teaching

International Price List in US Dollars
April 2019

(Prices subject to change without notice)

Condensed Matter Physics, CMP1-A

TeachSpin's Condensed-Matter Physics initiative is a modular package, built of parts that can be purchased separately. Users, for example, might provide their own Vacuum (pumping) System. Users will likely start with the Variable Temperature Cryostat System and the Cryostat Support Electronics listed below. The (three) experiments also listed below are built to mount in the TeachSpin Cryostat, but they can be purchased in any order or combination.

Variable Temperature Cryostat System……$17,023.00
Includes: Completely Wired 80-400K Dewar, Thermocouple Gauge with Two Sensors, VacuumValves, Sample Chambers, Heaters and Diode Thermometers, Interface Connector Box, D-sub cables (3), Custom Wooden Dewar Support, Manual

Cryostat Support Electronics……..……..$6,738.00
Includes: SRS "Mainframe" SIM 900, SRS Diode Temperature Monitor SIM 922, TeachSpin's PI Temperature Controller PITC1-A, (3) Mounted Diode Thermometers, TeachSpin's Dual Current Supply DCS1-A, 2 Volteq HY6003D Power Supply, 4-3Ft. Banana-Jack Cables, Manual

Transport/ Electrical Experiments……..……$2,195.00
Includes: TeachSpin's Constant Current Source CCS1-A, Sample Platform 6-Wire Connector, Two Mounted Semiconductor Samples n-, p- type Si, Circuit Board Platform, 3 Evaporation Substrates, Manual
Recommended Accessory: Fluke 287 Multimeter…….…… $561.00

Magnetic Susceptibility Experiments……..……$3,713.00
Includes: Hartshorn-Coil Assembly, TeachSpin's Hartshorn Coil Driver HCD1-A, Various Sample Holders,Probe Coil, Temperature Probe, Sample Molds and Epoxy Kit, 12 Special Samples, Manual
NOTE: Measurement Requires Lock-In Amplifier, such as
TeachSpin's SPLIA1-A…….. $3,245.00

Specific Heat Experiments……..……$3,988.00
Includes: TeachSpin's Pulsed Current Source PC1-A, High Gain Utility Amplifier HGUA1-A, Complete Addendum and Hardware, Sample Molds and Epoxy Kit, 14 Special Samples, Manual

Superconductivity……...……..……$3,108.00
Includes: High T_c Superconductivity Controller; Magnetic Field Hall Voltage and Temperature Servo HTC1-A, Three Different B5SCO Samples, Two Special Sample Mounts with Thermometers, Special Hall Effect Sensor, Three Mounted Permanent Magnets, and Instructor/Student Manual

Note: To measure the magnetic susceptibility of the superconductivity sample requires the Hartshorn coils and electronic components of the Magnetic Susceptibility CMP

Recommended Additions: the High Gain Utility Amplifier (HGUA1-A) SIM modules allows the precise DC measurements of very small values of resistivits. Even smaller values of resistivity can be studied using the AC methods which require the use of a lockin amplifier such as TeachSpin's SPLI1-A

Vacuum System…….....$9,213.00
Includes: Pfeiffer HiCube 80 Turbo Pump, Complete Valve, Lines, Cross, O-Rings, Clamps, Etc., Pirani/Cold Cathode Vacuum Gauge, Custom Wood Stand, Instructions for Operation

TeachSpin's Dual Current Supply for Diode Thermometry DCS1-A……..……..…..….$875.00
High Gain Utility Amplifier SIM Module HGUA1-A……...$1,375.00
Pulsed Current PC1-A……..…….$1,073.00
Power Supply for Two SIM Modules, TeachSpin CMPPS1-A……..……...$325.00
Constant Current Source CCS1-A……$961.00
Room Temperature Hall Effect Experiments……..……$1,865.00
Includes: p-type & n-type Silicon Samples, and Copper Sample
Recommended Accessory: Additional Silicon Sample ….……..……..…….....$435.00
Evaporation Substrates…….……..……1-9 $22 each, $160 for 10
Additional Semiconductor Samples……. Inquire
Fluke 287 Multimeter…….…….. $561.00

Foundational Magnetic Susceptibility…… $1,898.00
Includes: Microbalance, Sample Manipulator, Material Samples (16), Sample Containers (24), Suspended Magnet, Current-Loop Calibrator, Graphite Levitation Kit, Manual

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Diode Laser Spectroscopy, DLS1-A*

Enhanced Instrument* . . . . . **$ 21,450.00**

Includes: Laser Head · Fabry-Perot Cavity · 1 Extra Diode Lasers (tested) · Complete Electronics (*Laser Controller, Cell Temperature Controller, Detector Electronics*) · 3 Photodiode Detectors with preamp. · IR Viewing Card · CCD Camera · TV Monitor · Optics with all mounts and bases (*5 Mirrors, High Power Neutral Density Filter, 2 Neutral Density Filter sets with holder, 1° Optical Beam Splitter, 2° Optical Beam Splitter, 2-50/50 Beam Splitter, Flat Beam Splitter, 2 Rotating Linear Polarizers, 2 Rotating ¼-Wave Plates* · Absorption Cell Assembly (*Rb Cell, Helmholtz Coils, Cell Heater, Rotating Stand*) · 2 Safety Goggles · Special Tools · Black Anodized Aluminum Optical Bread Board 24″ x 36″ x ½″ · Instructor/Student Manual

*** Magnetic field experiments require a separate current controlled power supply.**

Complete Instrument . . . . . **$ 19,665.00**
(Excludes Fabry-Perot Cavity)

Recommended Accessories:
Fabry-Perot Cavity FP1-A . . . . . $ 2,085.00

DLS Partial Systems Available:

Any System without Bread Board, deduct ….**$ 621.00**

Basic Experiments, DLSB1-A . . . . . **$ 18,290.00**
This system **does not include** optics needed for simultaneous interferometry or several magnetic field experiments. Items Deleted: 1 Photodiode Detector (Center), 2 Mirrors, 2° Beam Splitter, 1 50/50 Beam Splitter, Flat Beam Splitter, 2 Rotating Linear Polarizers, 2 Rotating ¼-Wave Plates
Note: This system does not includes Bread board

Diode Laser and Controller, DLHC1-A $ 13,669.00
Includes: Laser Head · 2 Diode Lasers (tested) · Complete Electronics (with cell temperature controller and detector electronics) · Manual · 2 pair Mandatory Safety Goggles

Optical Detector, DLOD1-A . . . . . **…$ 524.00**
Includes: Complete Mounting Hardware · Photodiode with Low-Noise Preamp · Hood

Earth's Field NMR, EFNMR1-Bi*

Complete System including Gradient/Field Coil*. . . . . .$ 8,795.00

Includes: Sample and Bucking Coil · Electronics for Sample and Bucking Coil (*Polarization Timer, High-Q Tuned Amplifier, Tuning Controls, Sound Amplification, Built-In Speaker*) · 2 Sample Holders · Gradient/ Field Coil System (*x,y,z Gradient Coils, Helmholtz Field Coils, Controller with Built-In Gradient Coil Power Supply*) · Segmented Sample Holder with filling syringe · Set of 3 Fluorine Samples (non-volatile, non-toxic) · Dip Needle Compass · All Connecting Cables · Instructor/Student Manual

*** 2 Separate current controlled power supplies required. Polarizing 60V 3 A – Volteq; Gradient/Field - Inquire**

Premium System . . . . . .**$ 9,885.00**
(Includes Hall Effect Probe)

Recommended Accessories/Additional Parts:
Spin Flip Coils 295.00
Additional Set Fluorine Liquid Samples . . . 209.00
non-volatile, non-toxic perfluoropolyether fluids (HT-110, HT-70, PFS-2)
Extra Sample Holders 7.15
Additional Segmented Sample Holder with filling syringe 160.00
Hall Effect Probe (if purchased with EF)….. 440.00

EFNMR Partial Systems Available:

Basic Instrument, EFNMR1-**Ai**. . . . . **$ 5,869.00**
Includes: Sample and Bucking Coil · Electronics for Sample and Bucking Coil (*Polarization Timer, High-Q Tuned Amplifier, Tuning Controls, Sound Amplification, Built-In Speaker*) · 2 Sample Holders · All Connecting Cables · Instructor/Student Manual

Earth's Field NMR Gradient/Field Coil System, EFGFC1-Ai.* . . . . **$ 4,325.00**
Includes: x,y,z Gradient Coils, Helmholtz Field Coils, Controller with Built-In Gradient Coil Power Supply · Dip Needle Compass · Segmented Sample Holder with filling syringe · All Connecting Cables · Instructor/Student Manual

***Power Supply Needed - Inquire**
With Hall Effect Probe $4,715.00

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Fabry-Perot Cavity, FP1-A*

Basic Instrument*. . . . . $ 2,085.00

Includes: Confocal 20 cm Cavity {*Free Spectral Range - 375 MHz, Finesse ~ 100, Mirror reflectivity >99%, Center Freq., 780 nm, band width (99% reflectivity) 80 nm*} · Iris · 2 Support Posts with bases · Manual

***FP1-A requires a variable frequency laser**
(Side bands observable with DLS1-A & RF signal generator)

Faraday Rotation, FR1-B*

Enhanced Instrument . . . . . $ 2,635.00

Includes: Two Laser Light Sources- Red, Green, Solenoid, High Verdet Constant · Glass Rod with Polished Ends · Liquid Sample Cell · Optical Detector · Optical Detector · Linear Polarizer in Calibrated Rotating Mount · Wooden Base · Low-Pass Filter · Power Audio Amplifier with Laser Power Supply ·High Current(6A) DC Power Supply ·Instructor/Student Manuals

Basic Instrument . . . . . .$ 1,441.00

Includes: Red Laser Light source · Solenoid · Glass Rod with Polished Ends · Optical Detector · Linear Polarizer in Calibrated Rotating Mount · Wooden Base · Manuals

Replacement/Additional Parts and Accessories:

Additional Glass Rod 203.00
Liquid Cell. 203.00
Green Laser Upgrade (w/Low-Pass Filter) . 545.00
Power/Audio Amplifier 500.00
Hall Effect Probe (if purchased with FR) . . .440.00
Signal Processor/Lock-In. (SPLI-A) 3,245.00
(SPLI-A needed for AC Measurements)

***NOTES – FR1-A requires power supplies**
Solenoid: Current regulated supply capable of 3-6 A
Laser: Voltage regulated supply, 4 volt, 40 mA, such as PAA1-A. PAA1-A can also provide the Audio Amp function for AC measurement.
AC Measurement needs a Lock-In such as SPLI1-A

Foundational Magnetic Susceptibilty

Complete Instrument. . . . . $ 1,898.00

Includes: Microbalance, Sample Manipulator, Material Samples (16), Sample Containers (24), Suspended Magnet, Current-Loop Calibrator, Graphite Levitation Kit, Manual

Fourier Methods, FM1-A*

Complete Instrument *. . . . . $ 10,285.00

Includes: Stanford Research Systems SR770 Spectrum Analyzer (w/USB Port) • Electronic Modules (*Analog Summer, Analog Multiplier, Audio Mixer, Radio-Frequency Mixer; Analog High-Low-Bandpass Filter, Wide-Band Amp, Power Audio Amp, Speaker; Voltage-Controlled Oscillator for FM Generation, DC Voltage Supply; Lorenz Analog Chaos, LCR Resonance, 'Buried Treasure' for Signal-Under-Noise, Intermodulation Distortion*) • Accessories for Audio (3.5 mm/BNC) Interconnections • External Experiments (*Fluxgate Magnetometer • Acoustic Resonator • Coupled Oscillator*) • Accessories (*Microphone • AM Antenna • Universal Power Supply • Cables/Connectors*) • Instruction Manual

TeachSpin Physics Package . . . . $ 5,385.00

Includes: Electronic Modules • External Experiments** • Instruction Manual

*** FM1-A Requires Low End Digital Oscilloscope, a DC Power Supply and a Function Generator**

Hall Effect Probe, HE1-A

Complete Instrument . . . . . $ 490.00

3 or more units 475.00

Includes: Probe with axial and radial detectors · Non-magnetic base and support rod · HECK1-A Calibration Kit (*Helmholtz 4" coil form, support for coil form, 4 spools of wire for student use*.)

Magnetic Force, MF1-A*

Complete Instrument * . . . . . $ 622.00

5 or more units 615.00

Includes: Helmholtz Coils · Tower with Cap · Magnetic Dipole in Gimbal · Calibrated Spring · 1 g weights (set of 5) · Instructor/Student Manual

Replacement Parts:

Hall Effect Probe (if purchased with MF). . . 440.00
Tower with Cap 61.00
Magnetic Dipole in Gimbal 105.00
Brass Rod & Spring. 28.00
Spring 18.00
1 g weights (set of 5) 5.00

***MF1-A requires a 36 volt, 3 A, current regulated power supply such as the Volteq HY6003D**

Magnetic Torque, MT2-A

Complete Instrument . . . . . $ 3,878.00
Including Magnetic Force Balance Kit

3 or more units 3,768.00

Includes: Magnet Coils · Air Bearing · Power Supply · Air Pump · Electronics for Strobe Light and Counter · One Magnetic Sphere · Magnetic Force Balance Kit · Rotating Magnetic Field · Gravitational Torque Arms and Sliding Weight · Instructor/Student Manual

Recommended Accessories:

Magnetic Force Tower Kit 198.00
Includes: Tower with Cap, Dipole in Gimbal, Spring on brass rod, Weights,
Hall Effect Probe (if purchased with MT). . . 440.00

Replacement/Additional Parts:

Additional Magnetic Sphere. 105.00
Replacement Air Pump 215.00
Replacement Torque Arm 18.00
Sliding weight for Torque Arm 26.00
Magnetic Force Balance, for MT1-A 325.00
Replacement Flash Lamp 18.00

***Without* Rotating Magnetic Field, deduct $ 154.00**

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Modern Interferometry, MI1-B*

Complete Instrument* . . . . . **$ 19,168.00**

Includes: Kit contains all elements to configure Michelson, Sagnac or Mach-Zehnder Interferometers and to perform a wide variety of experiments.
Proprietary Apparatus: *Translational Stage, High Stability Mirror Mounts (3), Optics for Quadrature Detection, Large Area Photodiode Detectors (2), Solenoid, Pressure Transducer, Light Sources (4), Electronics for Fringe Counting – (optics with bases)*
All Parts for Experiments on*: Index of Refraction of Gas, Electro-optic Effect, Magnetostriction, Piezo Electricity, Thermal Expansion, White Light Fringes, and Absolute Spatial Dimension.*· Optical Breadboard with Stabilizers · Student/Instructor Manual

*** Customer must supply power for white light source Magnetostriction experiments require a current regulated 36 volt, 3 A powers supply**

Complete without Breadboard . . . $ 18,573.00

Optical Detector, MIOD1-A . . . . . **$ 545.00**
Includes: Complete Mounting Hardware · Large Diameter Photodiode with Low-Noise Preamp

Flexure Mirror Mount, MIMM1-A . . . . . **$ 589.00**
Includes: High-Stability Flexure Mirror Mount · Base · Extra Mirror (Please specify Horizontal or Vertical Hinge)

*Prices for Individual Components available upon request

Muon Physics, MP1-A*

Complete Instrument*. . . . . .$ 5,495.00

Includes: Detector Module containing Scintillator, Photomultiplier, High Voltage Power Supply, LED with Variable Pulser · Electronics · Software with Source Code Instructor/Student Manual

***Requires User Supplied Computer**

Noise Fundamentals, NF1-A*

Complete Instrument *. $9,268.00

Includes: High-Level Electronics Controller, Low-Level Electronics Controller, Temperature Module w/ Probe, Break-out Box, Clear Dewar in Adjustable Height Support, Coax Cables, 45 Watt +/-15 Volt Power Supply, Hook Up Wire, Resistors, Transistors, Diodes, Photodiode in Holder, Light Bulbs and LEDS, Spare Operational Amplifiers, Instructor/Student Manual

***(Requires User supplied Low End Digital Oscilloscope, a Good digital voltmeter and a Function Generator such as the Rigol Fuction Generator)**

Optical Pumping, OP1-E*

Complete Instrument*. . . . . $ 16,485.00

Includes: Rubidium Lamp · High Homogeneity Horizontal and Vertical Magnetic Field Coils on Base · Complete Optical System (*Absorption Cell, Interference Filter, Linear Polarizer, λ/4 Wave Plate, Optical Rail, Optical Detector/Preamplifier, Lenses*) · Cell Heater · Complete Electronic Controller (*RF Amplifier, Detector Amplifier, Horizontal Magnetic Field Sweep, Vertical Field, Temperature Controller, Internal Power Supply*) · Instructor/Student Manual

***Recommended Accessories*:**
Circuit Diagrams 110.00

Rubidium Lamp . . . . . $ 4,015.00
Available Independently, See Individual Components
REQUIRES Power Supply Capable of 28 V/0.5 A

***NOTES:**
1. **For basic operation, OP1-E requires an RF Signal Generator, 100 kHz – 20 MHz.**
2. **High Magnetic Field Experiments require an additional power supply ≥ 36 V, 3 A.**

Power/Audio Amplifier, PAA1-A

Complete Instrument . . . . . $ 501.00

Includes: Electronics described below, Universal "Brick-on-a-rope" Power supply, Instruction Manual

Specifications
Freq. Range: DC-20 kHz
Gain: Variable
Max Outputs: 1.0 A (Peak), 10 Volt (Peak to Peak)
Laser Power Supply: 4.1V@ 0.1A

Pulsed/CW NMR Spectrometer, PS2-C

Complete Instrument . . . . . $ 20,515.00
Includes: **New 1-D Imaging Capability and Layered Sample Kit**, Magnet with Sample Head · Complete Electronics (*Power Supply, Receiver, Pulse Programmer, 15 MHz OSC/AMP/Mixer*) · 7 BNC Cables · AC Power Cord · Sample Case with 50 Vials and Caps · Instructor/Student Manual

***Recommended Accessories*:**
Circuit Diagrams 135.00

***Replacement Parts*:**
50 Vials with Caps 95.00

PNMR Without Magnet – Inquire

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Quantum Analogs, QA1-A*

Complete Instrument* . . . . . $ **5,035.00**

Includes: Atom-Molecule Models (4 Aluminum Hemispheres - *one with built-in speaker and microphone, one with built-in microphone*) · Band Gap Model (*base, speaker, microphone, 2 sets of cylinders, 3 sets of iris*) Complete Electronics (*AC low noise Amplifier, Amplitude Detector, Frequency to voltage converter*) · Instructor/Student Manual

User Computer with Sound Card . . . . . **Inquire**

*** QA1-A requires a Sine wave generator capable of producing 1-50 kHz with a peak-to-peak voltage of 0.50 V.**

Room Temperature Hall Effect Experiments

Complete Instrument* **$1,865.00**

Includes: p-type & n-type Silicon Samples, Copper Sample

Replacement/Additional Parts:

Silicon Sample……$435.00
Evaporation Substrates……1-9 $22 each
$160 for 10
Additional Semiconductor Samples…… Inquire
Fluke 287 Multimeter……..... $545.00

SPAD- Single Photon Avalance Diode

Complete Instrument. **$435**

Includes: INQUIRE

Signal Processor/Lock-In Amplifier, SPLIA1-A

Complete Instrument . . . . . **$ 3,245.00**

Includes: Preamplifier · Filter · Low-Pass Amplifier · Oscillator · Phase Shifter · Noise Generator · Attenuator · Amplitude and Lock-In Detector · Seven Short BNC Cables · Instructor/Student Manual

***Recommended Accessory*:**

Power/Audio Amplifier PAA1-A 501.00
Circuit Diagrams 110.00

Torsional Oscillator, TO1-A*

Complete Instrument*. . . . . **$ 4,593.00**

Includes: INQUIRE

6 or more units 4,483.00

*** Driven oscillation experiments require a function or signal generator capable of 0.1 – 10 Hz. For high Q measurements, a frequency resolution of 0.01 Hz will be needed.**

NEW Torsional Oscillator Auxiliary Electronics AE1-A*

Complete Instrument*. . . . . **$ 935.00**

Includes: INQUIRE

Two-Slit Interference, One Photon at a Time, TWS2-A

Complete Instrument . . . . . **$ 7,838.00**

Includes: U Channel with Optics · Power Supply · Cables · Detachable Detector System including Photodiode and hotomultiplier · Cricket · Pulse Counter/Interval Timer· Instructor/Student Manual

Replacement/Additional Parts:

Replacement Slits 215.00

Stand Alone Accessories

Pulsed Counter/Interval Timer
PCIT1-A . . . . . **$ 952.00**

Individual Components

Breadboard with stiffening ribs . . ..**$ 1,227.00**
(Required for MI1-A Kit)
Black Anodized Aluminum 24″ x 36″ x ½″

Breadboard Only . . . . . **$ 1,095.00**

Rubidium Lamp . . . . . **$ 4,015.00**

Includes: Rb 9 mm diameter bulb, 75 – 90 MHz RF oscillator, 120 °C temperature regulated oven, Natural isotopic concentration with 3 Torr Xenon buffer
REQUIRES Power Supply Capable of 28 V/0.5 A

Photodiode Photodetectors

Spectral Range: 400 – 1000 nm, Variable Gain
Power Supply Required: ± 12 V

Includes: Complete Mounting Hardware · Large Diameter Photodiode with Low-Noise

Small Area (31 mm^2) For DLS/OP . **$ 501.00**

Large Area (100 mm^2) For MI. . **$ 534.00**

High-Stability Flexure Mirror Mount with Base and extra mirror . . . . . **$ 589.00**

Please Specify Horizontal or Vertical Hinge.

Training at TeachSpin . . . . . .**$ 550.00**

Includes: Full day of on-site training