Instruments required for conduct of General Physics Experiments for M.Sc Physics Program with specialization in (a) Electronics (b) Materials Science (c) Space Physics and (d) Nanoscience

EXPERIMENTS	APPARATUS USED
First Year	
Determination of e/k using npn transistor	Transistor SL100/SK 100 ,voltmeter (multimeter is good), ammeter, rheostat (40 ohm), thermometer , water bath, eliminator (source must have low ripple factor)
Analysis of absorption spectrum of KMnO4	Spectrometer, prism ,scale &telescope, test tube, Mercury vapour lamp, freshly prepared KMnO4 solution, incandescent lamp, mirror
Ultrasonics	Spectrometer, RF oscillator, quartz crystal, sodium vapor lamp ,liquid – distilled water or xylene, Benzene, CCl4, kerosene, Hare's apparatus
Determination of elastic constants by Cornu's method (elliptical and hyperbolic fringes)	Sodium vapour lamp ,travelling microscope ,knife edge,weight hanger, plane convex lens,glass plate, // Cornu's apparatus
Anderson Bridge	Resistant boxes, headphone, eliminator,galvanometer, capacitor(Paper) ,audio frequency ,oscillator, given coils, six way key (2)
Laser grating	Helium neon laser ,diffraction grating/single slit/double slit/meter scale, optical bench,screen
Laser diffraction at single slit	laser,single slit, optical bench,screen
Study of photoelectric effect and determination of of Planck's constant	Digital nanometer 0 to 200 nA, digital voltmeter 2V,ten turn plot, five different colour filters.
Young's modulus of different materials using strain gauge	Strain gauge, voltage indicator, weight hanger,slotted weight
Determination of wave length of light using LED	LED ,digital DC voltmeter, resistors, DC power supply, photo diode experimental setup
Identification of Fraunhofer lines in solar spectra	Spectrometer, Mirror, Grating

Cauchy's constants of liquids and liquid mixtures using hollow prism and spectrometer	Spectrometer, hollow prism, liquids
Anderson Bridge –determination of self and mutual inductance	Resistance boxes, fractional resistance, DC source, Signal generator, headphone, capacitor, coils
Michelson Interferometer experiments	Michelson interferometer
Verification of Richardson's equation using diode valve	Diode valve, milliammeter, voltmeter
Surface tension of a liquid using Jaeger's method	Manometer, capillary tube, liquid, beaker
Second year experiments	
e/m of an electron using Thomson's method	Cathode ray tube, compass box, bar magnets,
Determination of fermi energy of copper	Carey foster's bridge, 2 equal resistances, copper strip, galvanometer, thermometer, water bath, six way key (2), eliminator
Hall effect	Hall probe, Ge or Si crystal, Gauss meter, electromagnet, hall coefficient set up
Study of variation of semiconductor with the temperature and determination of band gap	Four probe set up, semiconductor wafer // Diode, rheostat, voltmeter, ammeter.
Magnetic susceptibility- Quincke's method	Electromagnet, power supply, quinck's tube, gauss meter, travelling microscope, measuring jar, Hare's apparatus
Refractive index of liquids using Abbey's refractometer	Abbe's refractometer, sodium vapour lamp, water, glycerine
Study of characteristics GM tube	GM counting system, GM detector with connecting cable, samples, lead shield
Electrical characteristics of a solar cell	Solar cell, ammeter, voltmeter

Studies using UV visible spectrophotometer	UV visible spectrophotometer and sample
Ferromagnetic studies using Guoy's method	Gouy's method apparatus // Electromagnets , with electromagnet power supply , a digital gauss meter , a sensitive balance, and a sample.
Rydberg constant determination using grating	Diffraction spectrometer, grating, sodium vapour lamp, hydrogen discharge source.
Thermo-emf of bulk samples like Al	Thermocouple trainer kit, Constantan thermocouple, thermometers, connecting wires.

Note:- Any other experimental setup which could be used for doing the experiments mentioned may also be employed.

Instruments required for conduct of Electronics Experiments for M.Sc Physics Program with specialization in (a) Electronics (b) Materials Science (c) Space Physics and (d) Nanoscience

Lab should be equipped with Oscilloscopes, DC power supplies and Signal generators – 1 each for 2 students.

Components such as Transistors, Diodes, Integrated Chips, Resistors, Capacitors, Transformers, etc. Provision for constructing circuits bread boards and soldering should be available.

List given below is only indicative and the experiments can be performed using alternate designs also

EXPERIMENTS –FIRST YEAR ELECTRONICS	APPARATUS USED
First year experiments	
• Single stage CE amplifier	Transistor BC 107, voltage source, CRO ,signal source Resistors ;Rc= 2.4 k ohm, RE= 600 ohm, R1 =101k ohm, R2 =21 .11 k ohm, RL =1.8 k ohm Capacitors; CE = 64 micro F,Cinp= 1.4micro F ,Cout =1.4 microfarad
• Astable multi vibrator	2 transistor BC107, CRO Resistors; RC1=RC2=6.025k ohm(used 68kohm) RB1=RB2=116.5kohm (used 100kohm)
• Voltage controlled oscillator	Transistor BC107, functional generator, CRO Resistors; RC1=RC2=5.85k ohm(used 6.8kohm) RB1=RB2=329.38k ohm(used 330kohm) C1=C2=0.0022microF
• RC phase shift oscillator	Transistor BC107 ,CRO Resistors;RC=2.4 kohm,RE=600 ohm,R1=101kohm,R2=21.16k ohm Capacitors; CE=4.7microF
• Negative feedback	Transistor, capacitor, CRO, functional generator RC=202k ohm, RE=680ohm,R2=22k ohm,R1=100k ohm,RL=2.2kohm,Rin=2.2kohm Capacitors;Cinp=1.4microF.Cc=1.4 CE=47
• Emitter follower	Transistor ,CRO,frequency oscillator Resistors;RE=3kohm,R2=37kohm,R1=27kohm,Rin=13kohm Capacitor;Cc=Cinp=1.6microF

• Schmitt trigger	Battery, CRO, frequency generator, transistorBC107, resistors, capacitors
Second year experiments	
• Study of active filter using OPAMP Low pass filter -first order High pass filter -first order Low pass filter -second order High pass filter- second order Band pass filter	OPAMP (IC741), Signal generator, CRO, Dual power supply. **Resistors:** R1= 10 Kohm, R2= 10kohm, RL= 10kohm, R= 15 Kohm **Capacitor** C= 0.01microF **Resistors:** R1= 27 Kohm, R2= 15kohm, R3= 15 kohm, RL= 10kohm, Rf= 15 Kohm **Capacitors** C1= 0.01microF C2= 0.01 microF **Resistors:** R1= 10 Kohm, R2= 10kohm, RL= 10kohm, R= 15 Kohm **Capacitor** C= 0.01microF **Resistors:** R1= 27 Kohm, R2= 33kohm, R3= 33 kohm, RL= 10kohm, Rf= 15 Kohm **Capacitors** C1= 0.0047microF C2= 0.0047 microF **Resistors:** R1= 4.7 Kohm, R2= 5.6kohm, R3= 100 kohm, RL= 10kohm, Rf= 15 Kohm **Capacitors** C1= 0.01microF C2= 0.01 microF
Wave form generator using opamp (IC 741) • Astable multivibrator • Monostable multivibrator • Triangular wave form generator	Power supply, op-amp, CRO, Capacitors, resistors **Resistors** R1=R2=10 kohm resistors and capacitors for required frequency. **Resistors** R1= 1kohm R2=180 ohm, resistors and capacitors for required frequency.

The 555 Timer • Astable multivibrator • Voltage controlled oscillator • Monostable multivibrator	IC 555, DC source, CRO, capacitors, resistors, power supply Capacitors and Resistors for required frequency
Differential amplifier	Functional generator, CRO, dual power supply **Resistors:** Rc= 3kohm, RE= 3kohm,

Microprocessor Kit for doing microprocessor based experiments (1 per 2 students)

Computers for programme execution