Facilities at UGC-DAE Consortium for Scientific Research, Indore Centre

Sr. No.	Facility Name	Status	Charges
1.	Raman Spectroscopy Horiba JY, France make micro Raman spectroscopy system and Oxford-Witec make AFM coupled-Raman spectroscopy system Excitation Laser 473 nm, 532 nm, 633 nm Temperature range 4 K – 800 K Linear polarization analysis and Raman mapping/imaging 100 micron-100 micron at step size of 1 micron		Rs 1,800/- per sample for Raman analysis Rs. 5,000/- per hour per sample for polarization, imaging and mapping Rs. 5,000/- temperature dependent measurements from -190 °C to RT, and RT to 500 °C) Rs. 10,000/- per sample for 4 K to RT
2.	Home-fabricated Electrical resistivity and thermopower setups (5-330K)		Temp. rate @ 10 °C/min 5000/- per sample
3.	Furnaces (up to 1600 C)		10,000/- per 24 hours
4.	Dielectric measurements Bulk, thin film samples; Make : Home-made insert with LCR meter from Hioki Temperature range : 80-400 K Frequency Range : up to 10 Hz -1 MHz Measurement mode : Capacitance vs temperature and frequency, PE with voltage up to 10V. Sample : 8mm diameter pellets of thickness less than 0.5mm		2500/- per sample at room temperature 5,000/- per sample per 6 hours at any temperature upto 6 hours, 1000/- per hour after 6 hours.
5.	LTHM Scanning Probe microscope Scanning Modes: Atomic Force Microscopy *Magnetic Force Microscopy* Make: Attocube, Germany (SPM probe) American Magnetics (Magnet/cryostat) Temperature range : 5 - 300 K Magnetic field : ±9 Tesla Scan Area: 17 μm x 17 μm at 5K 34 μm x 34 μm at 300 K Sample: ~ 8 mm x 8mm with flat polished surface (rms roughness~10nm^2) Spatial resolution: better than 100nm		20,000/- for three hour slot
6.	Ac-Susceptibility Setup Home made Ac-susceptibility system with very high sensitivity 10^{-8} emu		10,000/- per 24 hours upto liquid Nitrogen temperature

7.	7-Tesla SQUID Magnetometer **Magnetic Property Measurement System SQUID-VSM** Make: MPMS3 Quantum Design, USA Temperature range: 2-400 K Magnetic field: ±7 Tesla Sensitivity: 10^{-8} emu Mode: M vs. H, M vs. T Sample required: ~10 mg piece (available sample space: 3mm diameter cylinder) Additional measurement option: (i) Pressure Cell for M vs T and M vs H measurement up to 1 GPa pressure (ii) LHe^3 for measurement down to 500 mK		20,000/- per 24 hours
8.	16-Tesla VSM **Magnetic Property Measurement System 16 T-Vibrating Sample Magnetometer** Make: MPMS3 Quantum Design, USA Temperature range: 2-400 K Magnetic field: ±16 Tesla Sensitivity: 10^{-5} emu Mode: M vs. H, M vs. T Sample required: ~50 mg piece (available sample space: 3mm diameter cylinder)		20,000/- per 24 hours
9.	**9 Tesla Physical Properties Measurement System for specific heat** Make: Quantum Design, USA Temperature range: 2-300 K Magnetic field: ±9 Tesla Method: Relaxation calorimeter Resolution: 10nJ at 2 K Absolute accuracy: 2-5% @ 2K; 5-10% at 300 K Sample requirement: Weight: ~10 mg Size: less than 3mm x 3mm with thickness less than 1mm Shape: Any shape with one flat surface		20,000/- per 24 hours
10.	Soft x-ray absorption at Indus-2 BL-1 Energy range: 100 eV to 1200 eV Measurement types: x-ray absorption near edge structure (XANES), magnetic circular dichroism (MCD) Sample types: Solid samples (e.g. thin films, pellets) Temperature range: 10 – 300 K Magnetic field: 0 – 2T		Rs 7500/- per hour.
11.	D8 Advance - Powder XRD Bruker D8 Advance (Germany) Equipped with 1D PSD (Bruket LynxEye)		1000/- per sample

	sample requirements: up to 25 mm dia; max thickness 3 mm		
12.	Electrochemical Workstation (CHI660E) Electrochemical studies & intensity modulated photocurrent spectroscopy Electrochemical Analyzer/Workstation: https://www.chinstruments.com/chi600.shtml		2,000/- per hour
13.	Ultrasonic sample cleaner		500/- per hour
14.	9T PPMS for Resistivity, magnetoresistance and Hall measurements Make : Quantum Design USA Temperature range: 2-350K Magnetic field: upto 9T DC resistivity range: Max upto 10 Mohm AC resistivity / Hall Measurements: 100 Ohm Sample Dimensions: Preferably rectangular sample 8mmx 4mm size.		3,000/- per sample (measurement time within 1 hours) or 20,000/- per 24 hours
15.	16 T PPMS - For resistivity and magnetoresistance Make: Quantum Design USA Temperature Range: 2K to 350K Magnetic field: upto 16T Maximum resistance: 5 M Ohm Sample Size: preferably rectangular of size 8 mm by 4 mm by 2 mm		20,000/- per 24 hours
16.	Grazing Incidence X-ray Scattering Beamline (BL-13) 5-20 KeV beam size 0.3×0.1 mm2 X-ray reflectivity, reciprocal space mapping Low temperature powder XRD 10K to 300 K In-plane diffraction		Rs 7500/- per hour.
17.	UHV e-beam deposition For growth of metallic thin films with a control of thickness ~2 A		5,000/- per deposition per sample (metal chunks to be provided by industry or will be charged extra as per material)
18.	UHV system for in-situ growth and MOKE, RHEED, x-ray reflectivity, MR measurements		30,000/- for 24 hours
19.	Scanning Electron Microscopy (SEM) & EDS		4000/- for SEM and 2,000/- EDS per sample
20.	14-Tesla VSM Magnetization and resistivity measurements on thin film and bulk samples; 2 to 350 K, up to 14T		20,000/- per 24 hours

21.	Veeco make SPM scanning probe microscope AFM/MFM Only Room temperature magnetic samples Thin film or solid pellet 8mm X8mm max		4000/- sample
22.	Bruker made Bio-AFM (Bioscope resolve) Room temperature only Any type of sample Thin film or solid pellet 8mm X8mm max		Per 3Hrs slot (Max sample 3/Slot) 8000/-
23.	Nanoscope E AFM from DI, USA		3,000/- per sample
24.	FE-SEM - FEI made NOVA NANOSEM 450 FEI (Fesem) Bruker (EDS) Raith (e-beam litho)		6000/- per sample surface or cross section 9000/- per sample surface plus cross section EDS 2000/- per sample
25.	Quantum design make Physical property measurement system (PPMS) Resistivity and Heat capacity measurement 2K to 350K Upto 12T magnetic field Thin film or solid pellet of 7mmX3mm (Resistivity measurements) Single piece flat upto 20mg (Heat capacity measurements		20,000/- per 24 hours
26.	AIPES beamline at Indus-1 For Photoelectron spectroscopy, resonant photoelectron spectroscopy Synchrotron Radiation source (10-200 eV), TGM-2600 toroidal grating monochromator, EA 125 1800 hemispherical analyzer, Sample preparation chamber, Argon ion gun, X-ray sources Mg & Al Kα, Temperature: 725-77K. For bulk/ thin films		Rs 7500/- per hour.
27.	Pulsed Laser Deposition For deposition of thin films of oxides, metals KrF Excimer Laser source (248 nm), Rep. rate: 50 Hz Max, Pulse duration: 20 ns. Substrate temperature up to 700C		4000/- per deposition of sample, substrate to be provided by the industry or will be charged extra
28.	PLD-Laser MBE RHEED assisted Pulsed Laser Deposition KrF Excimer Laser source (248 nm), Rep. rate: 50 Hz Max, Pulse duration: 20 ns. Substrate temperature up to 700C		5000/- per deposition of sample, substrate to be provided by the industry or will be charged extra
29.	SQUID-VSM for Thin Films		20,000/- per 24 hours

	Temperature range: 1.8 – 350 K and 350 – 1000 K		
30.	Diff. Scan. Calorimeter (DSC) (Mettler-Toledo) Temperature range: -150 to 600 C; ± 0.1 to ±200 °C/min ramp; Inert-N2 & O2 Environments		Heating Program: Temp. Range @ 10 ℃/min RT- 700 ℃ per sample 4500/- Low Temp. -150 to 25 ℃ (RT) 9000/- per sample Cp measurement 12,500/- per sample
31.	(Magneto-dielectric-setup) Broadband Impedance Analyzer(Novo-Control) Temperature range: 5K to 500 C, Magnetic field (upto 9T), Electric field (±500V ,AC or DC), Frequency (30 μHz -10 MHz).		20,000/- per 24 hours
32.	P-E Loop Tracer (Radiant Technologies) capable of measuring ferroelectric hysteresis loops, leakage current, fatigue etc., on ceramics (100 – 400 K) and thin films (4.2 - 300 K and 2.5 Tesla) & piezoelectric displacement on ceramic pellets at 300 K ±10kV max; 30 mHz to 250 kHz, Bulk/Thin-films		2500/- per sample at room temperature 5,000/- per sample per 6 hours at any temperature upto 6 hours, 1000/- per hour after 6 hours.
33.	Depth profilometer (Stylus) For measuring thickness of films		2,000/- per sample
34.	Mettler-Toledo AG Semi-Microbalance For weighing samples		1000/- per hour
35.	UV-Vis Spectroscopy Perkin Elmer, USA, Model: Lambda 950 Range: 170 to 3300 nm Sources: Deuterium arc discharge lamp for UV region, and Tungsten lamp for Vis and NIR region Detector: PMT for UV-Vis region and PbS photodiode for NIR region Dual beam dual monochromator Measurement geometries: Transmission, Reflection, diffuse reflection Sample requirement: Thin film samples: Sample size minimum 0.5 cm x 1 cm on transparent substrate. Powder samples: 100 mg finely ground dry powder.		1000/- per sample
36.	FTIR Spectroscopy Bruker, Germany, Model: Vertex 70 Range: 50 to 7500 cm^{-1} Measurement geometries: Transmission, Reflection, ATR		1200/- per sample for routine spectrum Additional 1200/- per sample for FAR IR range

	Sample requirement: Finely ground powder ~5 mg for transmission measurement (in KBr pellet) Reflection: Thin film 1 cm x 1 cm ATR (780 to 4000 cm^{-1}): Powder 100 mg or thin film of min few microns thickness or sample pieces of 5 mm x 5 mm or more		
37.	XPS – SPECS System Electron Spectroscopy for Chemical Analysis Phoibos 150 mm Hemispherical Electron Energy Analyser Variable Pass energy, step size, dwell time Variable sample tilt angle (0° to 70°) to vary surface sensitivity 1D-DLD detector XPS: Dual anode X-ray source: Al Kα and Mg Kα Sample surface cleaning: 0 to 3 KeV Ar^+ ion sputtering, sample scraper file Sample requirements: Pellets: 10 mm diameter, 0.5-1.0 mm thick. Thin films: 1 cm x 1 cm.		6,000/- per sample for XPS 9,000/- per sample for UPS
38.	Mössbauer spectroscopy (^{57}Fe & ^{119}Sn) equipped with WissEl Velocity drives; ORTEC electronics etc., capable of measuring powder samples in transmission mode (2 K & 7 Tesla; 25 – 300 K & 300 – 1000 K) & thin films in conversion electron mode at 300 K		20,000/- per 24 hours
39.	HRXRD (thin film XRD) theta-theta goniometer with 0.0001 deg step size, 3kW X-ray generator with Cu target, Gobel mirror, LiF monochromator, LynxEye detector; XRR, GIXRD, RSM, phi-scans		2000/- per sample for single crystal sample
40.	Low-Temperature High-magnetic field XRD (LTHM-XRD) (Rigaku) (Cu, MO anode) Vertical sample loading, 2 – 5 % vibration effect Sample Temperature without field: 310 K - 9K (with CCR XRD) Sample Temperature with field (H = 8T): 310 K - 2K (with L-He) Sample requirement: Powder (< 5 μ) ~ 0.5 cc Temp. Stability: 0.1 K; Temp. Accuracy: 0.5 K Thermal drift: ~ 5 μ (± 0.002°) at 2θ = 30°		10,000/- per sample under field and temperature variation
41.	Ion-milling TEM sample Preparation facility		5,000/- per sample
42.	Transmission electron microscopy (TEM) 200 KV Transmission Electron Microscope		10,000/- per sample

	Sample requirements : non-magnetic powder. Temperature range: Room temperature to 77K Magnetic Samples are **NOT ALLOWED**		
43.	Dual X-ray photoelectron spectroscopy		Charges per sample or per hour 6,000/-
44.	Inverse photoemission spectroscopy		Charges per sample or per hour 10,000/-
45.	Ultrahigh vacuum scanning probe microscope		20,000/- per three hours slot
46.	Low energy electron diffraction		5,000/- per sample
47.	Laser Confocal scanning optical microscope (Zeiss LSM510META) 85k to 300k 458nm, 477nm, 488nm, 514nm, 543nm, 633nm excitations Pellets, thin films, biological samples that are processed with coverslips		5,000/- per sample per hour
48.	Nonlinear imaging - multiphoton imaging - upconversion Integrated femtosecond laser with confocal microscopy for Nonlinear Optics Applications Mai-Tai/Spectra-Physics Excitation range 690-1040nm, 85k to 300k		3000/- per sample
49.	Multizone Chemical Vapour Deposition System Qrystal 1100 /Quazar Technologies PVT Ltd For growth of 2D materials		5,000/- per sample
50.	Angle resolved photoemission spectroscopy		20,000/- per sample
51.	X-ray photoelectron spectroscopy		6,000/- per sample for XPS
52.	9T Magnet-Cryostat (Oxford NanoSystems) (MPS)		20,000/- per 24 hours
53.	Heat Capacity Measurement (100mK to 4.0K ; 0 to 16T (MPS)		40,000/- per 24 hours per sample
54.	Resistance Measurements (100mK to 4.0 K; 0 to 16T) (MPS)		40,000/- per 24 hours per sample
55.	AC Resistance Measurements (2K to 300K; 0 to 16T) (MPS)		20,000/- per 24 hours
56.	I-V Measurements (2K to 300K; 0 to 16T) (MPS)		20,000/- per 24 hours
57.	Resistance Measurements (2K to 300 K; 0 to 16T) (MPS)		20,000/- per 24 hours

58.	Heat Capacity Measurements (2K to 300K; 0 to 16T) (MPS)		20,000/- per 24 hours
59.	Glove Box		1000/- per hour
60.	Zeta potential-Nanoplus 3 For nano particle size distribution		1000/- per sample
61.	Arc Furnace		3000/- per sample growth (metal chunks to be provided by industry or will be charged extra at actuals)
62.	2-inch Target Magnetron Sputtering (i) IBS source: rf ion source, energy 0.25 to 1.2 keV, typical beam current 40 mA, Target size: 10 cmx10cmx1mm; up to 4 different targets (ii) UHV compatible chamber| 3× two inch magnetron sources, 2× dc power supplies, 3× MFCs		5,000/- per deposition (substrates to be provided by industry or will be charged extra, the charges for gold, platinum and other costly metals deposition is 2000/- extra per deposition)
63.	3-inch Target High Power Impulse Magnetron Sputtering (i) IBS source: rf ion source, energy 0.25 to 1.2 keV, typical beam current 40 mA, Target size: 10 cmx10cmx1mm; up to 4 different targets (ii) 4× 3-inch magnetrons; 3× dc power supplies; substrate temperature: 80 K or 300 - 1000 K; load-lock; in-situ RHEED; in-situ RGA; base pressure 5x10-8 Torr; rf-substrate bias; substrate rotation; single layer, multilayer or co-sputtering options; substrate height adjustment; possibility to mix 3 gases		7,000/- per deposition (substrates to be provided by industry or will be charged extra, the charges for gold, platinum and other costly metals deposition is 2000/- extra per deposition)
64.	RF magnetron sputtering (high pressure) Excel instruments, India Suitable for deposition of insulating oxide materials; Base pressure better than 10^-7 Torr; 2" and 1" targets Deposition temperature up to 700C		7,000/- per deposition (substrates to be provided by industry or will be charged extra,
65.	UHV-Rapid Thermal Annealing Ramp rate 100 K/s, Base pressure 1×10^{-9} mbar (process chamber), 5x10-8 mbar (load lock chamber), load lock with pre-heating (to remove moisture), maximum temperature 1273 K, thermocouple and pyrometer for temperature measurement and control, fully automated computer-controlled system for state of art rapid thermal processing/annealing.		3000/- per sample for four hours

66.	High Vacuum Thermal Annealing Ramp rate 100 K/s, Base pressure 1×10^{-9} mbar (process chamber), 5x10-8 mbar (load lock chamber), load lock with pre-heating (to remove moisture), maximum temperature 1273 K, thermocouple and pyrometer for temperature measurement and control, fully automated computer-controlled system for state of art rapid thermal processing/annealing.		2000/- per sample for four hours
67.	Secondary Ion Mass Spectroscopy Hiden Analytic (UK) Gas gun E = 5 keV, I = 100 - 400 nA; base pressure 2x10-10 mbar, sample size: 10mm×10mm×1mm; up to 9 samples can be loaded at a time		3000/- per sample
68.	Benchtop spectrophotometer – colorimeter (CHNspec DS-36D) Wavelength range: 360 - 780 nm (step 10 nm), Lighting source: Pulsed Xenon lamps and LED; Resolution: 0.01%, sample requirements: thin film samples		3000/- per sample
69.	Ion Beam Sputtering (i) IBS source: rf ion source, energy 0.25 to 1.2 keV, typical beam current 40 mA, Target size: 10 cmx10cmx1mm; up to 4 different targets		3000/- per sample
70.	Langmuir Blodgett thin film Deposition		3000/- per film
71.	Table-top coater For coating metallic (Au) contact of few nm thickness		3000/- per coating
72.	Spin-coating system: Programmable operation Acceleration: 0 – 3,000 rpm/ sec RPM: 0-10,000 Vacuum chuck for holding the substrates		1000/- per sample per hour
73.	Microwave assisted hybrid high temperature (1400 C) furnace		10,000/- per 24 hours
74.	MOKE: magnetometer and microscopy For thin films: Temp: 4.2 – 300 K & 300 - 600 K; Magnetic Field: In-plane: 1 Tesla (at RT) & 0.32 Tesla (Temp variation); Out-of-plane: 1 Tesla (at RT) & 100 mT (Temp variation) ; CCD 16 frames/sec		2000/- per sample at room temperature. 5,000/- for six hours for temperature dependent measurements, 1000/- per hour extra.
75.	Optical floating zone for crystal growth **Quantum Design IR Image Furnace (OFZ)** 2100° Celsius Temperature in Floating Zone Region		10,000/- growth of one crystal @24 hours

	Excellent IR Power Stability Gold coated 4-Mirrors & Halogen lamps		
76.	Table-top XRD: Theta-Theta; accuracy ± 0.02°, Achievable peak width < 0.05°, X-ray wavelengths Cu, Detectors 1-dimensional LYNXEYE0.002		1000/- per sample