Professor, Department of Applied Sciences
Spintronic and Magnetic Materials Laboratory
Indian Institute of Information Technology Allahabad
Jhalwa, Prayagraj-211012, India
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Pramod Kumar

Curriculum Vitae

○ PROFILE IIITA ○ ORCID ○ RESEARCH GATE ○ GOOGLE SCHOLAR

PERSONAL INFORMATION

- **Date of Birth:** 29 July 1975
- **Nationality:** Indian
- **Gender:** Male
- **Marital Status:** Married

CAREER SUMMARY

I (Dr. Pramod Kumar) am an experimentalist with a specialization in magneto-thermal and transport studies of inter-metallic compounds, spintronic devices, SCES systems, 2D electronic systems (like grapheme, GaAs/AlGaAs), topological insulator (like Bi_2Te_3) with supplementary experience in nanoscale device fabrication, cryogenic, scanning probe microscopy, Raman spectroscopy, XRD, crystal growth, microwave and UHV technique, microwave induced oscillations and Photovoltaic effects.

I obtained my PhD in Physics from the Indian Institute of Technology Bombay (2002-2007), India. Subsequently, I worked at IFW Dresden (2007-2008), Germany; the Tulane University (2009-1010), New Orleans, USA; and Georgia State University (2010-2012), Atlanta, USA. I joined as Assistant Professor at the Indian Institute of Information Technology, Allahabad in 2012.

EDUCATION

2002 – 2008 **Doctor of Philosophy (PhD) Physics**, *Indian Institute of Technology Bombay (IIT Bombay)*, India.

1998 – 2000 **Master of Science (M.Sc) Physics (Electronics)**, *Banaras Hindu University*, Varanasi, India.

1995 – 1998 **Bachelor of Science (B.Sc) (Physics, Chemistry, Mathematics)**, *Purvanchal University*, Varanasi, India.

RESEARCH INTERESTS

1. **Experimental Condensed Matter Physics:**
   - Quantum Material & Devices
   - Topological-magnetic Heterostructure
   - Ultrafast spin dynamics
   - Photodetector, Solar Cell, TFT
   - Shape memory Alloy
   - Magnetic Refrigeretor (Magnetocaloric effect)

RESEARCH EXPERIENCES

1. **Professor** **2025 - Present**

   Department of Applied Sciences, Indian Institute of Information Technology Allahabad, Uttar Pradesh, India.

2. **Associate Professor** **Jan 2019 - 2024**

   Department of Applied Sciences, Indian Institute of Information Technology Allahabad, Uttar Pradesh, India.

3. **Assistant Professor** **Sept 2012 - Jan 2019**

   Department of Applied Sciences, Indian Institute of Information Technology Allahabad, Uttar Pradesh, India.

4. **Assistant Professor** **July 2012 - Aug 2012**
   Kirori Mal College, University of Delhi, India.
5. **Research Associate of Physics** **April 2010 - July 2012**
   Georgia State University, USA
6. **Research Associate of Physics** **Feb 2009 - Feb 2010**
   Tulane University, USA
7. **Guest Scientist** **Oct 2007 - Dec 2008**
   Guest Scientist, Germany
8. **Teaching Associate** **July 2002 - Sep 2007**
   Indian Institute of Technology Mumbai India.

LIST OF PUBLICATIONS

1. Gautum V. et al., and **Kumar P.,** *Unraveling the Impact of Magnetic Doping on Photoresponse Properties of Bi2Se3 Topological Insulator, ACS Applied Nano Materials* **25**, 12864 (2025).
2. Gautam V. et al., and **Kumar P.,** *Optoelectronic insights into topological insulator Bi2Se3/Si heterojunction for photocurrent generation , Physica Scripta.* **100**, 085908 (2025).
3. Kumar R. et al., and **Kumar P.,** *Creatinine detection in artificial urine using perylenediimide probe single split resonator device, IEEE Sensors Journal ,* (2025).
4. Maurya G. et al., and **Kumar P.,** *Enhanced wide band spectral photodetection (UV-NIR) and high detectivity investigated in topological p-TlBiSe2/n-ITO heterojunction, Materials Science in Semiconductor Processing* **193**, 109513 (2025).
5. Singh R. et al., and **Kumar P.,** *Magnetic Field-Driven Charge Carrier Dynamics and Time-Reversal Symmetry Breaking in Individual TI/FM Heterostructures (Bi2Se3/Ni80Fe20/p-Si, Bi2Te2Se/Ni80Fe20/p-Si, and TlBiSe2/Ni80Fe20/p-Si) via Pump-Probe Spectro scopy, Journal of Physics and Chemistry of Solids* **200**, 112594 (2025).
6. Kumar A., Kumar P., and **Antonio D. B.,** *Focus on synthesis, characterization and applications of low dimensional nanomaterials, Nano Express* **5**, 040401 (2024).
7. Gautam V. et al., and **Kumar P.,** *Enhancement of Photocurrent in TI/TI (Bi2Se3/Bi2Te2Se) Heterojunction Devices: An Electronic and Optoelectronic Based Study , ACS Appl. Electron. Mater.* **7**, 480 (2025).
8. Gautam V. et al., and **Kumar P.,** *Bulk induced photo-current in topological insulating materials (Bulk induced photo-current in topological insulating materials (Bi_2Se_3/Si) heterojunction for highly responsive photodetectors, Journal of Physics D: Applied Physics* **58**, 065302 (2024).
9. Gautam V. et al., and **Kumar P.,** *Quasi-2D material based heterostructure devices and its applications, Journal of Physics D: Applied Physics* **57**, 443002 (2024).
10. Singh R. et al., and **Kumar P.,** *Effect of external/internal magnetic field on photocurrent in Py-topological insulator heterojunction $Ni_{80}Fe_{20}$/TI (Bi_2Te_3/Bi_2Se_3/Bi_2Te_2Se)/p-Si devices, Physical Chemistry Chemical Physics* **26**, 16708 – 16718 (2024).
11. Kumar R. et al., and **Kumar P.,** *Effect of band gap of graphene oxide on interaction with bovine serum albumin: Correlation of band gap with sensitivity, Carbon Trends* **15**, 100367 (2024).
12. Ahmad F. et al., and **Kumar P.,** *Aberrant photoelectric effect in the topological insulator/n-GaN heterojunction (Bi_2Te_3/n-GaN) under unpolarized illumination, Nanoscale* **16**, 604 – 613 (2024).
13. Maurya G. K. et al., and **Kumar P.,** *Topological Insulator $TlBiSe_2$/GaN Vertical Heterojunction Diode for High Responsive Broadband UV to Near-Infrared Photodetector, Journal of Electronic Materials* **53**, 1561 – 1576 (2024).
14. Maurya G. K. et al., and **Kumar P.,** *Visible to near-infrared broadband photodetector employing thin film topological insulator heterojunction (p-$TlBiSe_2$/n-Si) diode, Applied Surface Science* **612**, 155813 (2023).
15. Singh R. et al., and **Kumar P.,** *Proximity induced band gap opening in topological-magnetic heterostructure ($Ni_{80}Fe_{20}$/p-$TlBiSe_2$/p-Si) under ambient condition, Scientific Reports* **13**, 22290 (2023).
16. Verma S. K. et al., **Kumar P.,** Kumar A., and Wiemer C., *Bi_2Te_2Se and Sb_2Te_3 heterostructure based photodetectors with high responsivity and broadband photoresponse: experimental and theoretical analysis, Physical Chemistry Chemical Physics* **25**, 25008 – 25017 (2023).

17. Gautam R. et al., **Kumar P.,** and Kumar R., *Single Split Resonance Sensor Device for Detection of Bovine Serum Albumin Using Water Soluble Perylenediimide as Probe,* IEEE Sensors Journal **23**, 28579 – 28586 (2023).
18. Singh A. K. et al., **Kumar P.,** and Kumar N., *Spectroscopic Ellipsometry Study of Thermally Evaporated Tin Telluride (SnTe) Thin Films,* Journal of Electronic Materials **52**, 7132 – 7142 (2023).
19. Kumar S. et al., and **Kumar P.,** *Liquid Phase Exfoliated 2-D MoS_2-Based Broadband Heterojunction Low-Powered Photosensor,* IEEE Transactions on Electron Devices **70**, 1149 – 1155 (2023).
20. Singh A., **Kumar P.,** and Tiwari A., *Topologically protected multiple resonant modes in a one-dimensional photonic crystal heterostructure,* Journal of the Optical Society of America B **40**, 1092 – 1101 (2023).
21. Gautam V. et al., and **Kumar P.,** *Investigation of RF sputtered, n-Bi_2Se_3 heterojunction on p-Si for enhanced NIR optoelectronic applications,* Solar Energy Materials and Solar Cells **248**, 112028 (2022).
22. Shukla P., **Kumar P.,** and Misra P. K., *An Energy Efficient, Mismatch Tolerant Offset Compensating Hybrid MTJ/CMOS Magnetic Full Adder,* IEEE Transactions on Circuits and Systems II: Express Briefs **69**, 4548 – 4552 (2022).
23. Verma S. K., Kandpal K., and **Kumar P. et al.,** *Performance of Topological Insulator (Sb_2Te_3)-Based Vertical Stacking Photodetector on n-Si Substrate,* IEEE Transactions on Electron Devices **69**, 4342 – 4348 (2022).
24. Maurya G. K. et al., **Kumar P.,** and Tiwari A., *UV to NIR tunable photodetector using Bi_2Te_2Se/n-GaN heterojunction,* Surfaces and Interfaces **32**, 102152 (2022).
25. Ahuja M., **Kumar P.,** and Kumar R., *Lab-on-Paper Strip Chemical Sensor: Reversible Visible Sensor for Detection of Acids Using Naphthalenediimide Derivative,* IEEE Sensors Journal **22**, 12530 – 12538 (2022).
26. Ahmad F. et al., and **Kumar P.,** *Charge transfer induced symmetry breaking in GaN/Bi_2Se_3 topological heterostructure device,* npj 2D Materials and Applications **6**, 12 (2022).
27. Sharma S., and **Kumar P.,** *Modifications in the magnetocaloric effect owing to composition changes in $Gd_2In_{1-x}Ge_x$ ($0 \leq x \leq 0.2$) system of compounds,* AIP Advances **12**, 035127 (2022).
28. Sharma S. et al., and **Kumar P.,** *Effect of Ni substitution on the structural, magnetic, and thermodynamic properties in $Gd_{2-x}Ni_xIn$($0 \leq x \leq 1$) intermetallic compounds: An experimental and theoretical study,* Intermetallics **151**, 107743 (2022).
29. Ahmad F., Kandpal K., and **Kumar P.,** *Electrical properties of a metal-germanium-topological insulator (metal/n-Ge/p-Bi_2Te_3) heterostructure devices,* Journal of Materials Science: Materials in Electronics **32**, 8106 – 8121 (2021).
30. Sharma S., and **Kumar P.,** *XPS analysis of $Gd_5Ge_2Si_2$ and its Co-subsituted alloy,* Materials Today: Proceedings **46**, 10597 – 10599 (2021).
31. Singh A., **Kumar P.,** and Tiwari A., *Selective wavelength optical filters from mixed polymorph and binary integration of MoO_3 multilayer structures,* Optical Materials **111**, 110709 (2021).
32. Singh R. et al., and **Kumar P.,** *Magnetic, Optical and I-V Characteristics of MoO_3 thin films,* Journal of Physics: Conference Series **1947**, 012048 (2021).
33. Sharma S., Patel A. K., and **Kumar P.,** *Critical analysis of chemical and hydrostatic pressure-induced $Gd_5Si_2Ge_2$ alloy,* Materials Today Communications **26**, 102091 (2021).
34. **Kumar P. et al.,** *Chiral anomaly induced negative magnetoresistance and weak anti-localization in Weyl semimetal $Bi_{0.97}Sb_{0.03}$ alloy,* Journal of Physics: Condensed Matter **34**, 055601 (2021).
35. Maurya G. K. et al., and **Kumar P.,** *Dual-quadrant photodetection in topological insulator and silicon-based heterojunction (n-Bi_2Te_2Se/p-Si),* Applied Surface Science **565**, 150497 (2021).
36. Ahmad F. et al., and **Kumar P.,** *Effect of Doping and Annealing on Thermoelectric Properties of Bismuth Telluride Thin Films,* Journal of Electronic Materials **49**, 4195 – 4202 (2020).
37. Singh R. et al., and **Kumar P.,** *Material Study of Co_2CrAl Heusler Alloy Magnetic Thin Film and Co_2CrAl/n-Si Schottky Junction Device,* Journal of Electronic Materials **49**, 3652 – 3658 (2020).
38. Singh A. et al., and **Kumar P.,** *Heterogeneous integration of TiO_2 epitaxial growth for one-dimensional photonic crystal:An experimental and theoretical analysis,* Materials Today Communications **25**, 101367 (2020).
39. Kumar R. et al., and **Kumar P.,** *Flexible perylenediimide/GaN organic–inorganic hybrid system with exciting optical and interfacial properties,* Scientific Reports **10**, 10480 (2020).
40. Kumar S. et al., **Kumar P.,** and Kumar R., *Facile h-MoO_3 synthesis for NH3 gas sensing application at moderate operating temperature,* Sensors and Actuators B: Chemical **325**, 128974 (2020).
41. Ahmad F. et al., and **Kumar P.,** *Effect of Different Metallic Contacts on the Device Performance of a p-n Heterostructure of a Topological Insulator and Silicon (p-Bi_2Te_3/n-Si),* IEEE Transactions on

Electron Devices **67**, 5388 – 5395 (2020).
42. Sharma S. et al., and **Kumar P.,** *A comparative study on magnetocaloric effect in $NdRu_2Si_2$ and $NdRu_2Ge_2$,* *Materials Today: Proceedings* **28**, 149 – 152 (2020).
43. Sharma S. et al., and **Kumar P.,** *Anomalous magnetic properties in $LaFe_{11.5}Al_{1.5}$,* *Physical Chemistry Chemical Physics* **22**, 3425 – 3433 (2020).
44. Singh R. et al., and **Kumar P.,** *Effect of substrates & deposition temperatures on structural and magnetic properties of Co_2MnSi deposited by PLD,* *AIP Conference Proceedings* **2273**, 030001 (2020).
45. Bhardwaj K. et al., and **Kumar P.,** *Synthesis of graphene oxide with a lower band gap and study of charge transfer interactions with perylenediimide,* *New Journal of Chemistry* **20**, 12704 – 12714 (2020).
46. Dash S. et al., **Kumar P.,** Vasundhara M., and Patra A. K., *Impression of magnetic clusters, critical behavior and magnetocaloric effect in Fe_3Al alloys,* *Physical Chemistry Chemical Physics* **21**, 10823 – 10833 (2019).
47. Ahmad F. et al., and **Kumar P.,** *Fabrication of a p–n Heterojunction Using Topological Insulator Bi_2Te_3–Si and Its Annealing Response,* *Journal of Electronic Materials* **47**, 6972 – 6983 (2018).
48. **Kumar P.,** Kumar N., and Kumar R., *Unusual magneto-thermal properties in $Sr_4Ru_3O_{10}$,* *Materials Research Express* **4**, 026104 (2017).
49. Singh R. et al., and **Kumar P.,** *Comparative study of Co_2MnSi structural and surface morphological thin films on Si/SiO_2,* *Advanced Materials Proceedings* **2**, 76 – 79 (2017).
50. Ahmad F. et al., and **Kumar P.,** *Transient reflection spectra in topological nanocrystals of Bi_2Se_3, Bi_2Te_3, Bi_2Te_2Se,* *Advanced Materials Letters* **8**, 423 – 427 (2017).
51. Kumar R. et al., **Kumar P.,** and Chand S., *Fullerene grafted graphene oxide with effective charge transfer interactions,* *Carbon* **107**, 765 – 773 (2016).
52. **Kumar P. et al.,** *Heat Capacity, Magnetic And Lattice Dynamic Properties Of Pseudo-two Dimensional: $M_2Fe_2O(AsO_4)_2$ [M=K, $K_{0.79}Cs_{0.21}$ and Rb] Compounds,* *Advanced Materials Letters* **7**, 964 – 970 (2016).
53. **Kumar P. et al.,** *Anomalous magnetoresistance in topological insulator Bi_2Te_3,* *Advanced Materials Proceedings* **1**, 21 – 24 (2016).
54. Naqvi S. et al., **Kumar P.,** Kumar R., and Chand S., *Synthesis and ultrafast spectroscopic study of new [6, 6]methanofullerenes,* *RSC Advances* **6**, 24889 – 24897 (2016).
55. Singh R. et al., and **Kumar P.,** *Unusual Magnetism In $TbRu_2Ge_2$ Compound,* *Advanced Materials Letters* **7**, 813 – 816 (2016).
56. **Kumar P.,** Jain P., and Kumar R., *Pressure dependent magnetic, AC susceptibility and electrical properties of Nd_7Pd_3,* *RSC Advances* **5**, 58928 – 58935 (2015).
57. **Kumar P.,** and Kumar R., *Magnetocaloric effect and refrigeration cooling power in amorphous Gd_7Ru_3 alloys,* *AIP Advances* **5**, 077125 (2015).
58. Kumar R., Naqvi S., Gupta N., Gaurav K., Khan S., **Kumar P. et al.,** *Bulk synthesis of highly conducting graphene oxide with long range ordering,* *RSC Advances* **5**, 35893 – 35898 (2015).
59. Kumar R., **Kumar P. et al.,** *Stable graphite exfoliation by fullerenol intercalation via aqueous route,* *New Journal of Chemistry* **38**, 4922 – 4930 (2014).
60. **Kumar P. et al.,** *Crystal structure and negative magnetization in Sm_2Al and $Sm_{1.988}Gd_{0.012}Al$ compounds,* *Physica B: Condensed Matter* **448**, 6 – 8 (2014).
61. Garlea V. O., Sanjeewa L. D., McGuire M. A., **Kumar P. et al.,** *Complex magnetic behavior of the sawtooth Fe chains in $Rb_2Fe_2O(AsO_4)_2$,* *Physical Review B* **89**, 014426 (2014).
62. Qian B., Lee J., Hu J., Wang G. C., **Kumar P. et al.,** *Ferromagnetism in CuFeSb: Evidence of competing magnetic interactions in iron-based superconductors,* *Physical Review B* **85**, 144427 (2012).
63. Shekhar C., Srivastava A., **Kumar P. et al.,** *Upper critical field, critical current density and thermally activated flux flow in $CaFFe_{0.9}Co_{0.1}As$ superconductor,* *Superconductor Science and Technology* **25**, 045004 (2012).
64. Cadogan J. M., Avdeev M., **Kumar P. et al.,** *Neutron powder diffraction determination of the magnetic structure of Nd_2Al,* *Journal of Physics: Conference Series* **303**, 012026 (2011).
65. **Kumar P.,** Suresh K. G., and Nigam A. K., *Magnetothermal effect in Gd_3Rh,* *Journal of Applied Physics* **109**, 07A909 (2011).
66. **Kumar P. et al.,** *Large reversible magnetocaloric effect in Er_3Co compound,* *Journal of Applied Physics* **107**, 09A932 (2010).
67. Singh N. K., **Kumar P. et al.,** *Magnetic, magnetocaloric and magnetoresistance properties of Nd_7Pd_3,*

Journal of Physics: Condensed Matter **21**, 456004 (2009).

68. **Kumar P.,** Lyubina J., and Gutfleisch O., *Magnetic and magnetocaloric effect in melt spun $La_{1-x}R_xFe_{13-y}Al_yC_z$ (R = Pr and Nd) compounds,* *Journal of Physics D: Applied Physics* **42**, 205003 (2009).
69. Singh N. K., **Kumar P. et al.,** *Investigations on magnetic and magnetocaloric properties of the intermetallic compound TbAgAl,* *Journal of Applied Physics* **105**, 023901 (2009).
70. **Kumar P. et al.,** *Magnetocaloric and magnetotransport properties of R_2Ni_2Sn compounds (R=Ce, Nd, Sm, Gd, and Tb),* *Physical Review B* **77**, 184411 (2008).
71. **Kumar P. et al.,** *Pressure-induced changes in the magnetic and magnetocaloric properties of RMn_2Ge_2 (R = Sm, Gd),* *Physical Review B* **77**, 224427 (2008).
72. **Kumar P. et al.,** *Magnetic and magnetothermal properties of $La_{1-x}Nd_xFe_{11.5}Al_{1.5}$ compounds,* *Journal of Applied Physics* **103**, 07B338 (2008).
73. **Kumar P. et al.,** *Structural, magnetic and magnetocaloric properties of $La_{0.8}Gd_{0.2}Fe_{11.4}Si_{1.6}$,* *Physica B: Condensed Matter* **403**, 1015 – 1016 (2008).
74. **Kumar P.,** Suresh K. G., and Nigam A. K., *Magnetism, heat capacity, magnetocaloric effect and magneto-transport in R_2Al (R = Nd, Gd, Tb) compounds,* *Journal of Physics D: Applied Physics* **41**, 105007 (2008).
75. **Kumar P. et al.,** *Large reversible magnetocaloric effect in RNi compounds,* *Journal of Physics D: Applied Physics* **41**, 245006 (2008).
76. **Kumar P. et al.,** *Magnetic, magnetothermal, and magnetotransport properties in $SmMn_2Si_{2-x}Ge_x$ compounds,* *Journal of Applied Physics* **103**, 013909 (2008).
77. **Kumar P. et al.,** *Effect of Ge substitution for Si on the anomalous magnetocaloric and magnetoresistance properties of $GdMn_2Si_2$ compounds,* *Journal of Applied Physics* **101**, 013908 (2007).
78. **Kumar P. et al.,** *Heat capacity and magnetocaloric effect in polycrystalline $Gd_{1-x}Sm_xMn_2Si_2$,* *Journal of Magnetism and Magnetic Materials* **319**, 1 – 4 (2007).
79. **Kumar P. et al.,** *Magnetic and magnetocaloric properties of $Sm_xGd_{1-x}Mn_2Si_2$,* *Journal of Alloys and Compounds* **427**, 42 – 45 (2007).
80. Singh N. K., **Kumar P. et al.,** *Effect of Tm substitution on the magnetic and magnetocaloric properties in the intermetallic compounds $(Tb_{1-x}Tm_x)Co_2$,* *Journal of Physics D: Applied Physics* **40**, 1620 (2007).
81. Singh N. K., **Kumar P. et al.,** *Measurement of pressure effects on the magnetic and the magnetocaloric properties of the intermetallic compounds $DyCo_2$ and $Er(Co_{1-x}Si_x)_2$,* *Journal of Physics: Condensed Matter* **19**, 036213 (2007).
82. Banerjee D., **Kumar P. et al.,** *Anomalous magnetic and magnetocaloric properties of Er_2Ni_{17},* *Journal of Physics D: Applied Physics* **40**, 2691 (2007).
83. **Kumar P. et al.,** *Multiple magnetic transitions and the magnetocaloric effect in $Gd_{1-x}Sm_xMn_2Ge_2$ compounds,* *Journal of Physics: Condensed Matter* **19**, 386210 (2007).

AWARDS AND ACHIEVEMENTS

2025 **Best Poster Award**, *Quantum Quest, March 22-23, 2025*, IIT Kanpur.

2017 **Best Poster Award**, *International Conference on Magnetic Materials and Applications (ICMAGMA 2017)*, Hyderabad.

2015 **Selected as UGC-Assistant Professor**, *under Faculty Recharge Program (FRP)*, India.

2014 **Best Poster Award**, *IUAC World Polymer Congress (MACRO 2014)*, Chiangmai, Thailand.

2007 **Travel Award**, *Institute of Complex Adaptive Matter (ICAM)*, California, USA.

2007 **Qualified Graduate Aptitude Test in Engineering (GATE)**, *organized by MHRD, India.*

2007 **Travel Award**, *Vienna University*, Austria.

2007 **Served as a Session Chair**, *MMM Conference*, Tampa, FL, USA.

RESEARCH PROJECTS

1. **Topological Materials and Applications** **PI**
   Science and Engineering Research Board (SERB) *SR/FTP/PS – 107/2012*

2. **Spintronic Material and its Applications** **PI**
   Science and Engineering Research Board (SERB) *SB/S2/CMP – 079/2013*
3. **Spintronic Device Based on Hybrid Materials** **PI**
   Council of Science and Technology, Uttar Pradesh (CSTUP) *CST/D – 1307*
4. **Search for Novel Topological Materials- A joint Theoretical and Experimental Investigation** **Co-PI**
   India-Russia Joint Project *DST/INT/RUS/RSF/P – 47/2021(G)*
5. **Nanometer scaled Topological Insulators for future Micro and Opto Electronic Applications** **PI**
   Science and Engineering Research Board (SERB) *CRG/2022/000070*
6. **Advance Material and Instrumentation in Biomedical Engineering** **PI**
   Science and Engineering Research Board (SERB) *SB/SS/1630/13 – 14*
7. **Advance Material and Instrumentation in Biomedical Engineering** **Co-PI**
   Science and Engineering Research Board (SERB) *SB/SS/1969/14 – 15*
8. **Advance Material and Instrumentation in Biomedical Engineering** **Co-PI**
   Council of Scientific and Industrial Research (CSIR) *SYM/8863/13 – HRD*
9. **Fabrication of Devices for Topological Insulator as Black Hole** **Mentor**
   Department of Science and Technology (DST) DST/INSPIREFellowship/2019/IF190557
10. **Topological Insulators for future Micro and Opto Electronic Applications Mentor**
    Department of Science and Technology (DST) DST/INSPIREFellowship/2022/IF190557
11. **Exploring 2D Heterojunctions for Robust Topological Quantum Computing Applications: National Quantum Mission** **PI**
    Department of Science and Technology (DST) DST/INSPIREFellowship/2022/IF190557
12. **Decoding Ultrafast Spin Dynamics at Topological - Magnetic Interfaces leading to fabrication and characterization of novel spintronic devices** **PI**
    Department of Science and Technology (DST) *TPN/115427*

INSTITUTE RESEARCH PROJECTS

1. **U.P. Start-up Niti-2020 Coordinator**, 1.5 Cr
2. **MSME Innovation Scheme through Host Institute, Coordinator Coordinator**, 1.0 Cr
3. **Development of Center of Excellent on Assistive Technology with STPI and MeitY, Coordinator** **Coordinator**, 24.0 Cr
4. **Undergraduate Teaching Laboratories in Quantum Technologies under National Quantum Mission (NQM)** **PI**
   Department of Science and Technology (DST) *DST/NQM/UTL/2025/407*, 1.05 Cr

WORKSHOPS/CONFERENCES ORGANIZED

Mar - 2025 **Symposium and Workshop on Quantum Science and Technology**, organized by IIIT Allahabad, India. *March* 17 – 18, 2025

Dec - 2024 **One day symposium on Emerging Trends of Quantum Science and Technology** , organized by IIIT Allahabad, India. *Dec* 20, 2024

Oct - 2024 **workshop on Functional Materials and Simulation Techniques (FMST-2024)** , organized by IIIT Allahabad, India. *Oct* 21– 25, 2024

Dec - 2023 **IEEE Workshop on Recent Advances in Photonics (WRAP)**, organized by IIIT Allahabad, India. *Nov* 7 – 9, 2023

Jun - 2023 **Advanced Training Program on Experimental** & **Simulation Technique for Material Sciences**, organized by IIIT Allahabad, India. *Jun* 21 – 27, 2023

Aug - 2023 4 **Days Anveshika Program**, organized by IIIT Allahabad, India. *Aug* 28 – 31, 2023

Aug - 2023 2 **Days Anveshika Program**, organized by IIIT Allahabad, India. *Aug* 9 – 10, 2023

Apr - 2021 **3rd Workshop on Advanced Materials and Instruments-based Engineering (AMIBE-**2021), organized by IIIT Allahabad, India. *Apr* 16 – 20, 2021

2021 **Physics Workshop**, organized by IIIT Allahabad, India. *Jan – Apr* 2021

Oct - 2019 *XXXIV* **Annual IAPT Convention-**2019 & **National Seminar on Recent Advances** & **Innovations in Physics Teaching** & **Research (RAIPTR-**2019), organized by IIIT Allahabad, India. *Oct* 13 – 15, 2019

May - 2019 **Physics Workshop**, organized by IIIT Allahabad, India. *May* 24 – 25, 2019

May - 2015 **2nd Workshop on Advance Material and Instrumentation in Bio Medical Engineering (AMIBE-**2014), organized by IIIT Allahabad, India. *May* 9 – 13, 2015

COURSES TAUGHT

1. **Undergraduate and Postgraduate Levels:**
   - Engineering Physics
   - Electrodynamics
   - Degital Electronics
   - Electronics Circuit and Devices
   - Circuits Synthesis and Analysis
   - Modeling of VLSI
   - Mathematics
   - Spintronic and Magnetic Materials
   - Degital Design
   - Taken Several Lab sessions

PROFESSIONAL ACTIVITIES/SERVINGS

1. **Papers Reviewed for Journals:**
   - Applied Physics Letter
   - J. Appl. Physics
   - J. Physics: Condensed Matter
   - J. Physics D: Applied Physics
   - J. Alloy and Compounds
   - J. Magnetism and Magnetic Materials
   - Thin Solid Films
   - Journal of Material Sciences, Material in Electronics
   - Journal of Vacuum Science and Technology
   - MAPAN,Journal of Metrology Society of india
   - NPG Asia Materials
   - Physica Status Solidi
   - Pramana
   - Sensors and Actuators
   - ACS Applied Electronic Materials
   - Advanced Functional Materials
   - ChemPhotoChem
   - Heliyon
   - Journal of Chemical Physics
   - Material Today Communication
2. **Members of Scientific Communities:**
   - IEEE Senior Member
   - European Magnetic society
   - ICAM
   - American Physical Society
   - Magnetic Society of India
   - IAPT
3. **Editor of Journals for Special Issues:**
   - Optic Journal
   - Nano Express
   -
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SELECTED BOOKS PUBLICATIONS

1. **Preparation of Graphene Oxide from Tattered Graphite and Applications:** *LAP LAMBERT Academic Publishing GmbH & Germany,* $978-3-330-00286-9, 2016$.

2‘11. **Magnetocaloric Effect in Certain Rare Earth-Transition Metals:** *LAP LAMBERT Academic Publishing GmbH & Germany,* $978-3-8465-0344-7, 2012$.

3. **Recent Advances and Innovations in Physics Teaching and Research:** *LAP LAMBERT Academic Publishing GmbH & Germany,* $978-620-0-78765-1, 2020$.

4. **Inverse Magneto-Caloric Effect in Single Crystal of Ca2Ru3O7:** *LAMBERT Academic Publishing GmbH & Germany,* $978-620-0-78765-1, \text{page1}-4, 2023$.

5. **A review on experimental study of one dimensional photonic crystal:** *LAMBERT Academic Publishing GmbH & Germany,* $978-620-0-78765-1, \text{page5}-9, 2023$.

INVITED TALKS

1. *EESTER, Indian Institute of Technology Madras, India* **2025**
2. *Synthesis, Characterization and applications of Advanced Materials, NIT Uttarakhand, India* **2020**
3. *Intelligent Biomedical Micro-Electro-Mechanical Systems, IIIT Allahabad, India* **2020**
4. *SMST, Goa, India* **2020**
5. *Motilal Nehru National Institute of Technology, MNNIT Allahabad, India* **2019**
6. *ICAMPE, Mahatma Gandhi University, Kerala, India* **2015**
7. *ICMAGMA, Pondicherry University, India* **2014**
8. *Jawaharlal Nehru University, India* **2013**
9. *Louisiana State University, USA* **2010**
10. *Indian Institute of Science and Research Bhopal, India* **2009**
11. *Delhi University, India* **2010**
12. *Delhi University, India* **2009**
13. *Indian Institute of Technology Delhi, India* **2009**
14. *Indian Institute of Technology Roorkee, Uttarakhand, India* **2009**
15. *National High Field Lab, Florida, USA* **2007**

ADMINISTRATIVE RESPONSIBILITIES (COMMITTEE MEMBERS)

1. *Institute Innovation Council, Coordinator and Convener* ***IIIT Allahabad***
2. *Central Purchase Committee, Member* ***IIIT Allahabad***
3. *Research Council, Member* ***IIIT Allahabad***
4. *Grievance Committee Member* ***IIIT Allahabad***
5. *Associate Dean (Health and Transportation)* ***IIIT Allahabad***
6. *Associated NCC Officer (ANO)* ***IIIT Allahabad***
7. *Faculty In-Charge Purchase/Purchase Officer* ***IIIT Allahabad***
8. *Convener, CPC committee* ***IIIT Allahabad***
9. *Innovation & Incubation Foundation (Co-ordinator)* ***IIIT Allahabad***
10. *Convener, CAM committee* ***Department of Applied Sciences, IIIT Allahabad***
11. *Member, DPGC committee* ***Department of Applied Sciences, IIIT Allahabad***
12. *Member, Convener, DPC* ***Department of Applied Sciences, IIIT Allahabad***
16. *Kumbh Mela Project , Member* ***MNNIT Allahabad***
15. *Senate, Member* ***IIIT Allahabad***
13. *Director* ***Innovation and Incubation Foundation, IIIT Allahabad***
14. *Head of the Department* ***Department of Applied Sciences, IIIT Allahabad***
15. *BOG, Member* ***Government Engineering College, Ambedkar Nagar, U.P.***

WORK PRESENTED IN CONFERENCES/SYMPOSIUMS

National Conferences:

1. **Solid State Physics Symposium,** *Chandigarh,* India 2002.
2. **Solid State Physics Symposium,** *BARC, Mumbai,* India 2005.
3. **Solid State Physics Symposium,** *Bhopal, Madhya Pradesh,* India 2007.

International Conferences:

1. **International Conference on "Technological Advancements in Materials Science and Manufacturing (ICTAMSM-2021)"** *Feb* $19-20,2021$.
2. **International Conference on "Smart Materials for Sustainable Technology (SMST-2020)"** *Feb* $22-25,2020$.
3. **Materials Synthesis and Characterization Techniques,** *NIT Uttarakhand Sep* $7-11,2020$.
4. **Intelligent Biomedical-Micro-Electro-Mechanical System,** *organized by IIIT Allahabad Sep* $22-28,2020$.
5. **IEEE 8th International Conference on Photonics, ICP 2020** *May* $11-30,2020$.
6. **International Conference on Advanced Materials and Nanotechnology and International Workshop on Excited Charge Dynamics in Semiconductors,** *JIT Noida Feb* $20-22,2020$.
7. **International Conference on Mechanical, Materials and Renewable Energy (ICMMRE-2019)** *Feb* $6-7,2020$.
8. **9th ILL Annual School on Neutron Diffraction Data Treatment using the FullProf Suite** 2016**,** Grenoble, France 2016.
9. **International conference on Magnetic Materials and Applications (ICMAGMA2017),** *India* 2017.
10. **International Conference on Materials Science and Technology,** *India Mar* $1-4,2016$.
11. **1st International Conference on Advanced Materials for Power Engineering,** *India Dec* $11-13,2015$.
12. **International conference on Magnetic Materials and Applications (ICMAGMA-2015),** *India* 2015.
13. **20th International Conference on Magnetism,** *Barcelona, Spain Jul* 2015.
14. **International conference on Magnetic Materials and Applications (ICMAGMA-2014),** *India* 2014.
15. **Magnetic Materials and Applications (MagMA 2013),** *India* 2013.
16. **European Workshop on Epitaxial Graphene (EWEG-2013)** 2013.
17. **Indo-German Workshop on Advanced Materials for Future Energy Requirement 2012** 2012.
18. **3rd International Symposiumon the Scienceand Technology of Epitaxial Graphene,** *St. Augustine, USA* 2011.
19. **2nd International Symposium on the Science and Technology of Epitaxial Graphene Amelia Island,** *USA Dec* 2010.
20. **54th MMM conference,** *Atlanta, USA* 2010.
21. **INTERMAG 08,** *Madrid, Spain Dec* 2008.
22. **International Conference on Magnetic Materials (ICMM),** *Kolkata, India* 2007.
23. **52th MMM Conference,** *Florida, USA* 2007.

24. **Joint MMM/Intermag Conference,** *Maryland, USA* 2007.
25. **2nd International Conference of the IIR on Magnetic Refrigeration at Room Temperature,** *Portoroz, Slovenia* 2007.
26. **Indo-Singapore Symposium on Advanced Functional Materials,** *IIT Mumbai,* India 2006.
27. **International Conference on Physics of Mesoscopic and Disordered Materials,** *IIT Kanpur,* India 2006.

PhD STUDENTS

1. **Dr. Rashmi Singh** **Awarded**

   Thesis Title: *Structural, Magnetic and Optical Studies of Spintronic Materials (DMS & Heusler Alloys.*
2. **Dr. Faizan Ahmad** **Awarded**

   Thesis Title: *Investigations on Electronics behavior of Quasi-Two-Dimensional Topological Insulator (Bi2Te3) Thin Film for the Potential Semiconductor Device Applications.*
3. **Dr. Ankit Singh** **Awarded**

   Thesis Title: *Experimental and Theoretical Realization of Topological Phase Transition in Photonic Crystals.*
4. **Dr. Sanjay Sharma** **Awarded**

   Thesis Title: *Experimental and Theoretical Study of Magnetothermal and Magnetotransport Properties in Rare-Earth-Based Intermetallic Compounds)*
5. **Dr. Gyanendra K. Maurya** **Awarded**

   Thesis Title: *Topological Insulator Material (Bi2Te2Se & TlBiSe2) Based Heterojunction for Advanced Optoelectronic Applications.*
6. **Dr. Pratiksha Shukla** **Awarded**

   Thesis Title: *Proposed Energy Efficient Hybrid MTJ/CMOS Magnetic Logic Circuits with Improved Reliability.*
7. **Dr. Surendra Kumar** **Awarded**

   Thesis Title: *Study of Electrical Electronic and optical properties of 2D Molybdenum Trioxides and Di-chalcogenides MoX (X = O3 , S2 and Se2)*
8. **Vidushi Gautam** **Completed**

   Thesis Title: *Heterojunctions of topological insulators with silicon for photovoltaic and photodetection applications.*
9. **Sandeep Kumar Verma** **Completed**

   Thesis Title: *Experimental and Theoretical study of Topological Insulators based hetero structures*
10. **Roshani Singh** **Completed**

    Thesis Title: *Study of Ultrafast dynamics and Magnetic proximity effect in Quantum material based Topological-Magnetic heterostructure for emerging quantum devices applications.*
11. **Shahrukh** **Ongoing**

    Thesis Title: *To be decided.*
12. **Syed Mohd Zaid Ashraf** **Ongoing**

    Thesis Title: *To be decided.*

RESEARCH WORK SUMMARY

2002 – 2007 *My PhD work was mainly focused on the magnetic, magnetocaloric and magnetoresistance behavior of the ternary and pseudo binary compound. Magnetic properties of RMn_2X_2 compounds are strongly dependent on the intra-layer Mn-Mn distance. I verified these both with the help of chemical pressure as well as by external hydrostatic pressure. External applied pressure is found to produce a negative magneto– volume effect, resulting in a positive shift of the ferromagnetic transitions and negative shift of the antiferromagnetic transitions. Magnetic and magnetocaloric data suggest that the antiferromagnetic interaction get strengthened with pressure. In investigations on the R_2Ni_2Sn compounds I found that the occurrence of multiple magnetic transitions and field induce antiferromagnetic to ferromagnetic metamagnetic transition lead to large magnetocaloric and magnetoresistance in the compounds with R = Ce, Nd, Sm, Gd and Tb. In contrast to the usual observation of a single MCE peak, Tb_2Ni_2Sn and to a less extent Gd_2Ni_2Sn, shows oscillatory MCE behavior, with the entropy change is positive (negative MCE) at low temperature, but changes its sign and becomes negative (positive MCE) at higher temperatures. I analyzed this behavior in terms of the ferromagnetic (FM)-antiferromagnetic (AFM) phase coexistence and the variation in the ratio of these phases under different applied fields. The magneto resistance behavior was also found to be influenced by the phase coexistence. The studies on the R_2Al compounds have shown that apart from the magnetic transition associated with the onset of long range magnetic order, these compounds undergo an additional magnetic transition. It is seen that these secondary magnetic transitions does not alter significantly the magnetocaloric properties. Both magnetocaloric and magnetoresistance data seem to be in very good agreement with the magnetization data. Sm_2Al belonging to this series shows particularly interesting properties possibly due to spin-orbit compensation. These results (Oscillatory magnetocaloric effect, spin-orbit compensation, multiple magnetic transition, phase coexistences etc.) are very useful for application as well as fundamental point of view.*

2007 – 2008 *After submitting the Ph.D. thesis, I joined IFW Dresden, Germany, as Guest scientist in 2007. At IFW Dresden, my work was related to study on magnetocaloric effect in $La(Fe,Si,Al,C)_{13}$ based compounds. The low cost, easy and friendly preparation, and large magnetocaloric effect near room temperature make $La(Fe,M)_{13}$-based compounds more attractive as candidates for magnetic refrigerants, especially the potential application near room temperature. $La(Fe,M)_{13}$-based compounds may be a good candidate that can replace Gd metal as a room temperature refrigerant. All these efforts and achievements give us fresh hope that the magnetic refrigerators based on $La(Fe,M)_{13}$-based refrigerants may come true in industry and daily life in the near future.*

2009 – 2010 *In 2009, I got the offer from Tulane University, LA, USA, to work on Ru-based single crystals and Fe based new Materials with Prof. Z. Mao. There, I had successfully grown $Ca_3Ru_2O_7$ and $Sr_4Ru_3O_{10}$ single crystals using floating zone furnace. I presented this most unique and important work on $Sr_4Ru_3O_{10}$ in APS meeting, where trilayered ruthenate $Sr_4Ru_3O_{10}$ exhibits puzzling magnetic properties. For field applied along the c-axis it exhibits typical itinerant ferromagnetic (FM) behavior, while moderate field applied along the ab-plane can induce a metamagnetic (MM) transition. Such coexistence of ferromagnetism and metamagnetism has been shown to be associated with a multiple band effect; FM bands derived from d_{xy} orbital coexists with MM bands from d_{xz}, d_{yz} orbitals. Hall effect studies on this compound reveal that Fermi surface of $Sr_4Ru_3O_{10}$ changes dramatically through the MM transition. This Fermi surface change leads the Hall resistivity ρ_{xy} to strongly deviate from the scaling relation with magnetization, which holds at fields well below and above the*

MM transition field. Such a significant change of FS is unexpected for general itinerant MM transitions.

2010 – 2012 *I was working as Research Associate at Georgia State University, Atlanta, Georgia, USA with Prof. R. G. Mani, and intensively involved in probing the Microwave induced Quantum Hall effect (Shubnikov–de Haas Oscillations) in truly 2D graphene, quasi 2D Topological Insulator. These photovoltaic SdH oscillations are very sensitive to microwave power and frequency. High microwave power oscillations are exactly same as longitudinal resistance oscillations with $\pi/2$ phase shift. These results are very useful for future technology in photovoltaic devices. I was also involved in preparation of graphene using the chemical vapor deposition (CVD) system and successfully grown the single layer graphene in large area on cu-foil and transferred on SiO_2 substrate for further processing. The graphene is super keen conductor of electricity, some say even better than most semiconductors. The amazing thing about graphene is that its electrons can lose their mass, and so they move freely and constantly like a photon of light.*

2012 – Present *We are actively engaged in the fabrication and characterization of diodes and thin-film transistors (TFTs), focusing on quantum materials. Our research explores topological heterostructure based diodes, aiming to enhance charge transport and interfacial effects for improved electronic and optoelectronic performance. Additionally, we are fabricating TFTs based on topological insulators, investigating their potential for next-generation electronic applications. Beyond device fabrication, we are also studying topological-magnetic heterostructures, analyzing the interplay between spin and charge dynamics under the influence of an external magnetic field. These studies leverage ultrafast pump probe spectroscopy to probe ultrafast charge dynamics, providing insights into novel quantum phenomena.Electrical Characterization of our devices is performed using the Keithley 4200A-SCS Semiconductor Characterization System & Tunable light So focusing on current-voltage (I-V), capacitance-voltage (C-V), capacitance-frequency (C-f) behavior. Our work aims to bridge fundamental physics with practical applications, advancing the field of spintronics, optoelectronics, and topological electronics.*

LANGUAGES

1. Hindi — *Mother tongue*
2. English — *Fluent*

COLLABORATIONS

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- **Prof. A.K. Nigam (*Retired*)**
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