98th ANNUAL REPORT

Department of Physics and Astrophysics
Faculty of Science

1. Major Activities and Achievements

The Department of Physics and Astrophysics has maintained its position as the topmost QS ranked university physics department in India. It is also one of the largest physics departments in the country, with nearly 730 MSc students, 180 PhD students, and a current strength of 37 regular faculty members. It has sustained its high quality in research with nearly 300 research publications by faculty members, apart from those by students, in international refereed journals during the year. The faculty received several national and international grants and participated in collaborative projects across the globe. The department hosted various eminent researchers who gave inspiring lectures to motivate students. Alumni from the department occupy key positions in academics, administration, policy making and public life, in both the national and international zones. The M.Sc. curriculum of the department provides a wide choice of electives, including inter-disciplinary subjects, to its students. The department also offers a plethora of cutting-edge research topics under a vibrant Ph.D. program. An exclusive departmental portal http://physics.du.ac.in/, displaying regular updates on its academic and other activities, has successfully run online during the year.

2. Honours/Distinctions

Prof. Brajesh Chandra Choudhary

- Spokesperson, India-CMS Collaboration (August 2017 - August 2021).
- Spokesperson, Indian Institutions: Fermilab Collaboration in Neutrino Physics
- Member, CMS Finance Board (August 2019 - August 2021).
- Co-Chair, CMS Diversity Office (2020 – 2022).
- Member, Expert Committee, Department of Science and Technology (DST), Govt. of India, for reviewing research projects for award of scientific grants (2020-2021).
- Member, Mega Science Vision 2035: Committee constituted by the Office of Principal Scientific Adviser, Govt. of India (2020-2021).
- Member, Mega Sciences (Blue Sky) Committee to formulate Science, Technology and Innovation Policy 2020 (STIP-2020): Nominated by the office of the Principal Scientific Adviser, and Secretary, Department of Science and Technology, Government of India (continuing from 2020).
- Co-convener, SNOWMASS 2022 (USA) Topical Group for Public Policy and Government Engagement (continuing from 2020).
- Member, Board of Research Studies in Physics, Aligarh Muslim University (2020-2021).

Prof. Debajyoti Choudhury

- Member, PAC of Department of Science and Technology (DST), Govt. of India, for High Energy Physics, Nuclear Physics, Astrophysics, Plasma Physics and Nonlinear Dynamics (continuing in 2021)
- Member, Expert Committee of Department of Science and Technology (DST), Govt. of India, for SERC School in THEP (2020-2021).
- Member, Selection Committee for INSPIRE Faculty Awards (2020-2021).
- Member, Selection Committee for UGC-FRP (2020-21).

Prof. Patrick Das Gupta

- President, Indian association of General Relativity and Gravitation (IAGRG) (continuing from 2020).
- Member, Departmental Research Committee, Department of Physics, Indira Gandhi National Tribal University, Amarkantak, Chhattishgarh (continuing from 2020).
- Member, Under-Graduate Board of Studies in Physics, Pondicherry University, Puducherry – (continuing from 2020).

Prof. Vinay Gupta

- Coordinator, Centre for Advanced Studies (CAS-I), Department of Physics and Astrophysics, University of Delhi (2018 – 2023).

- Member, Technical Review and Advisory committee (TRAC), for DeitY project "Nanoelectronics Network for research & Applications" implemented by IISc, IITs (Bombay, Madras, Delhi, Kharagpur) in area of Energy and (2018 – 2022).
- Member, Expert committee, Post Graduate board of Studies and Research in Physics, Ch. Devilal University, Sirsa, Haryana (June 2019 - June 2021).
- Member, School Board, School of Physical and Mathematical Sciences, Central University of Haryana (2018 – 2021).

Prof. Samit Kr. Mandal

- Member, Board of Studies (BOS), Amity Institute of Nuclear Science and Technology, Amity University, Noida (2020-2021).
- Member, Committee for updating equivalent discipline for recruitment, Defence Research & Development Organization (DRDO) (2018 onwards).
- Member, Planning Committee, SERB School on Nuclear Physics (2018 onwards).
- Member (with voting right), NUSTAR Council, FAIR-NUSTAR project, GSI, Darmstadt, Germany (2018 onwards).
- Co-convenor, FAIR-NUSTAR-INDIA Collaboration (2017 onwards).
- Member, Expert committee, SERB High Risk High Reward Research (HRHR) (2017 onwards).
- Member, Special committee, Special Centre for Nanoscience (SCNS), Jawaharlal Nehru University (2020-2021).
- Member, Selection committees for JRF/Research Associate/Scientist, Inter-University Accelerator Center (2008 onwards).
- Member, Evaluation Committee for JRF to SRF, Inter-University Accelerator Center, (2008 onwards).

Prof. Shyama Rath

- Member, PAC of Department of Science and Technology (DST), Govt. of India, for High Energy Physics, Nuclear Physics, Astrophysics, Plasma Physics and Nonlinear Dynamics (2020-2021).
- Member, Post-Graduate Board of Studies in Physics, Pondicherry University, Puducherry -- continuing in 2020-21.
- Member, Departmental Research Committee, Delhi Technological University (2020-2021).
- Member, Selection Committee, KVPY (2020-2021).
- Member, Selection Committee, CSIR-SRF and RA (2020-2021).
- Member, Evaluation Committee, DST PhD Inspire Awards (2020-2021).

Prof. H.P. Singh

- Member, DST-JSPS, Indo-Japan Science Council (2016 onwards).
- Dean, International Relations, University of Delhi (2016 onwards).
- Chair, Time Allocation Committee, Indian Institute of Astrophysics (2018 onwards).

Prof. Annapoorni Subramaniam

- Member, Academic council, Jawaharlal Nehru University, Pondicherry University and Amity Institute of Nanotechnology (2020-2021).
- Local coordinator, GIAN (2020-2021).

Prof. Amita Chandra

- Member, University Research Council, Manav Rachna University (April 2019 - April 2021).
- Member, Board of Studies, School of Vocational Studies and Applied Sciences, Gautam Buddha University (2020-2021).
- Research Ambassador, DAAD (2014 onwards).

Prof. Nivedita Deo

- Member, Complex Systems Society (CCS), International (2020-2021).

Prof. Supriya K. Kar

- Recipient, Outstanding Reviewer Award 2020, Classical and Quantum Gravity, Institute of Physics Publishing, Bristol, United Kingdom.

Prof. Awadhesh Prasad

- Member, PAC of Department of Science and Technology (DST), Govt. of India, for High Energy Physics, Nuclear Physics, Astrophysics, Plasma Physics and Nonlinear Dynamics (2020-2021).

Dr. Devki Nandan Gupta

- Member, Subject Expert Committee, Union Public Service Commission (UPSC) (2020).

- Member, Selection Committee, Board of Research in Nuclear Sciences, DAE, Govt. of India (2020).
- Member, Student Research Committee, Department of Applied Physics, Delhi Technological University, Delhi (2020-2021).
- External Member, Departmental Research Committee (DRC), Manav Rachna University, Faridabad (2018-2021).
- Recipient, Outstanding Reviewer Award 2020, Atomic and Molecular Physics, Institute of Physics Publishing, Bristol, United Kingdom.
- Council Member, Plasma Science Society of India (PSSI) (2018-2021).

Dr. Sourav Sur

- Member, Indian association of General Relativity and Gravitation (IAGRG)-since 2001 (Life-time membership).
- Recipient, Outstanding Reviewer Award 2019, Classical and Quantum Gravity, Institute of Physics Publishing, Bristol, United Kingdom (Award received in April 2020).

Dr. Ajit Kumar Mahapatro

- Joint Secretary, Executive Council, Electron Microscopy Society of India (EMSI) (2020-2021)

3. Publications

Publication in Peer-reviewed Journals (International)	Publication in Peer-reviewed Journals (National)	Books / Chapters of Books (International Publisher)	Books / Chapters of Books (National Publisher)	Books / Chapters of Books (Local Publisher)	Total number of Publications
261	4	3	--	--	268 + 26 (Conf. Proc.) = **294**

SCI Journals (Total: 265)

Aad, G., Abbott, B., ..., Teague, D., Trembath-Reichert, S. [including Choudhary, B.C., Bhardwaj, A., Ranjan, K., Naimuddin, M.]. (2020). Combination of the W boson polarization measurements in top quark decays using ATLAS and CMS data at √s = 8 TeV, *Journal of High Energy Physics*, 2020(8), pp. 51.

Abazov, V.M., Abbott, B., Acharya, B.S., ..., Choudhary, B.C., …, Zieminska, D., Zivkovic, L. (2021). Study of the normalized transverse momentum distribution of W bosons produced in $p\bar{p}$ collisions at s =1.96 TeV, *Physical Review D*, 103(1), pp. 012003.

Abazov, V.M., Abbott, B., Acharya, B.S., …, Choudhary, B.C., …, Zieminska, D., Zivkovic, L. (2020). Studies of X (3872) and ψ (2S) production in $p\bar{p}$ collisions at 1.96 TeV studies of X (3872) and ψ (2S) production, *Physical Review D*, 102(7), pp. 072005.

Acero, M.A., Adamson, P., Aliaga, L., ..., Choudhary, B.C., …, Zhang, Y., Zwaska, R. (2021). Search for slow magnetic monopoles with the NOvA detector on the surface, *Physical Review D*, 103(1), pp. 012007.

Acero, M.A., Adamson, P., Agam, G., …, Choudhary, B.C., …, Zhang, Y., Zwaska, R. (2020). Adjusting neutrino interaction models and evaluating uncertainties using NOvA near detector data, *European Physical Journal C*, 80(12), pp. 1119.

Acero, M.A., Adamson, P., Agam, G., …, Choudhary, B.C., …, Zhang, Y., Zwaska, R. (2020). Supernova neutrino detection in NOvA, *Journal of Cosmology and Astroparticle Physics*, 2020(10), pp. 014.

Acero, M.A., Adamson, P., Aliaga, L., …, Choudhary, B.C., …, Zamorano, B., Zwaska, R. (2020). Measurement of neutrino-induced neutral-current coherent π0 production in the NOvA near detector, *Physical Review D*, 102(1), pp. 012004.

Acero, M.A., Adamson, P., Aliaga, L., …, Choudhary, B.C., …, Zhang, Y., Zwaska, R. (2020). Search for multimessenger signals in NOvA coincident with LIGO/Virgo detections, *Physical Review D*, 101(11), pp. 112006.

Ahmad, T., Jindal, K., Tomar, M., Jha, P.K., Gupta, V. (2021). Role of charge states and dopant site in governing electronic properties of Cr doped $BiFeO_3$, *Materials Chemistry and Physics*, 263, pp. 124438.

Ameer, S., Jindal, K., Tomar, M., Jha, P.K., Gupta, V. (2020). Tunable electronic and magnetic properties of 3d transition metal doped $Bi_2Fe_4O_9$, *Journal of Magnetism and Magnetic Materials*, 509, pp. 166893.

Ameer, S., Jindal, K., Tomar, M., Jha, P.K., Gupta, V. (2020). The role of an unintentional carbon dopant in resolving the controversial conductivity aspects in $BiFeO_3$, *Physical Chemistry Chemical Physics*, 22(18), pp. 10010.

Amrit, P., Jain, S., Tomar, M., Gupta, V., Joshi, B. (2020). Synthesis and characterization of sol gel derived nontoxic CZTS thin films without sulfurization, *International Journal of Applied Ceramic Technology*, 17(3), pp. 1194.

Asapur, P., Banerjee, I., Sahare, P.D., Mahapatra, S. (2021). Spectroscopic analysis of Muga silk nanoparticles synthesized by microwave method, *Biotechnology and Applied Biochemistry*, 68(2), pp. 345.

Bala, M., Masarrat, A., Kumar, V., ..., Asokan, K., Annapoorni, S. (2020). Effect of thermal annealing on thermoelectric properties of BixSb2−xTe3 thin films grown by sputtering, *Journal of Applied Physics*, 127(24), pp. 0002576.

Bala, N., Singh, H.K., Verma, S., Rath, S. (2020). Magnetic-order induced effects in nanocrystalline NiO probed by Raman spectroscopy, *Physical Review B*, 102(2), pp. 024423.

Banday, A., Shahid, R., Meena, S.S., Yusuf, S.M., Murugavel, S. (2020). Effect of crystallite size on the phase transition behavior of Heterosite FePO4, *Physical Chemistry Chemical Physics*, 22, pp. 15478.

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Batra, K., Sinha, N., Kumar, B. (2020). Tb-doped ZnO:PDMS based flexible nanogenerator with enhanced piezoelectric output performance by optimizing nanofiller concentration, *Ceramics International*, 46(15), pp. 24120.

Bhardwaj, A., Rejkuba, M., de Grijs, R., Herczeg, G.J., Singh, H.P., Kanbur, S., Ngeow, C.-C. (2020). Near-infrared Census of RR Lyrae Variables in the Messier 3 Globular Cluster and the Period-Luminosity Relations, *Astronomical Journal*, 160(5), pp. 220.

Bhardwaj, A., Rejkuba, M., de Grijs, R., Yang, S.-C., Herczeg, G.J., Marconi, M., Singh, H.P., Kanbur, S., Ngeow, C.-C. (2021). RR Lyrae Variables in Messier 53: Near-infrared Period-Luminosity Relations and the Calibration Using Gaia Early Data Release 3, *Astrophysical Journal*, 909(2), pp. 200.

Bhat, M.Y., Yadav, N., Hashmi, S.A. (2020). A high performance flexible gel polymer electrolyte incorporated with suberonitrile as additive for quasi-solid carbon supercapacitor, *Materials Science and Engineering B: Solid-State Materials for Advanced Technology*, 262, pp. 114721.

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Bhukkal, S., Kumar, B. (2020). Modified CZ technique for the growth of organic crystals having low melting point and high vapour pressure, *Journal of Crystal Growth*, 535, pp. 125534.

Bhushan, R., Pandey, A., Vaid, G., Singh, R.P., Kabiraj, D., Mehta, D., Kapil, A., Chamoli, S.K. (2021). Fabrication of 128Te thin target for nuclear levels lifetime measurements, *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 983, pp. 164586.

Boazbou Newmai, M., Pathak, N.K., Senthil Kumar, P. (2020). Molecular aspects of oligomer-coupled ultra-small Au nanoparticles, *Journal of Physics and Chemistry of Solids*, 140, pp. 109378.

Chakraborty, S., Sharma, H.P., Tiwary, S.S., Majumder, C., Banerjee, P., Ganguly, S., Kumar, S., Kumar, A., Kumar, A., Singh, R.P., Muralithar, S. (2020). Indication of gamma-vibration in 123,125,127I, *Journal of Physics G: Nuclear and Particle Physics*, 47, pp. 095104.

Chakraborty, S., Sharma, H.P., Tiwary, S.S., Majumder, C., Banerjee, P., Ganguly, S., Rai, S., Pragati, Mayank, Kumar, S., Kumar, A., Palit, R., Bhattacharjee, S.S., Singh, R.P., Muralithar, S. (2020). Gamma-vibration in 126Xe-revisit, *Nuclear Physics A*, 996, pp. 121687.

Chakraborty, S., Sharma, H.P., Tiwary, S.S., Majumder, C., Banerjee, P., Ganguly, S., Rai, S., Pragati, Modi, S., Arumugam, P., Mayank, Kumar, S., Kumar, A., Bhattacharjee, S.S., Singh, R.P., Muralithar, S. (2020). Signature splitting in the positive parity bands of 127Xe, *European Physical Journal A*, 56, pp. 50.

Chakraborty, S., Sharma, H.P., Tiwary, S.S., Majumder, C., Gupta, A.K., Kumar, A., Banerjee, P., Ganguly, S., Kumar, S., Kumar, A., Singh, R.P., Muralithar, S., Octupole correlations in 127I. (2021). *International Journal of Modern Physics E*, 50, pp. 2150030.

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Channey, K.S., Kumar, S. (2021). Breaking $\mu - \tau$ symmetry of tri-bimaximal mixing, *Journal of Physics G: Nuclear and Particle Physics*, 48(3), pp. 035003.

Chaudhari, R., Garg, A., Singh, K., ..., Gupta, V., RaviKant, C. (2021). Bismuth tri-iodide-polystyrene composite for X-rays switching applications at room temperature, *Radiation Physics and Chemistry*, 186, pp. 109538.

Chauhan, L., Kumar, S., Sreenivas, K., Shukla, A.K. (2021). Variable range hopping and modulus relaxation in NiFe2O4 ceramics, *Materials Chemistry and Physics*, 259, pp. 124135.

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Choudhary, S., Kumar, V., Malik, V., ..., Annapoorni, S., Malik, R. (2020). Synthesis of ZnO@Ag dumbbells for highly efficient visible-light photocatalysts, *Journal of Physics Condensed Matter*, 32(40), pp. 405202.

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Choudhury, D., Deka, K., Mandal, T., Sadhukhan, S. (2020). Neutrino and Z' phenomenology in an anomaly-free U(1) extension: role of higher-dimensional operators, *Journal of High Energy Physics*, 06, pp. 111.

Choudhury, D., Maharana, S., Sachdeva, D., Sahdev, V. (2021). Dark matter, muon anomalous magnetic moment, and the XENON1T excess, *Physical Review D*, 103, no. 1, pp. 015006.

Dahiya, A., Singh, S.S. (2020). Equation of State of PNJL model under the influence of thermal mass and magnetic field, *Pramana Journal of Physics*, 94(1), pp. 121.

Das Gupta, P. (2020). F J Dyson: The Man Who Would Make Patterns and Disturb the Universe, *Resonance*, 25(10), pp. 1319.

Das, P., Dattaf, U., Chakraborty, S., ..., Mandal, S.K., ..., Stora, T., Wadsworth, R. (2020). Study of exotic decay of Cs isotope close to the proton drip line, *Journal of Physics: Conference Series*, 1643(1), pp. 012127.

Das, S., Kanbur, S.M., Bellinger, E.P., Bhardwaj, A., Singh, H.P., Meerdink, B., Proietti, N., Chalmers, A., Jordan, R. (2020). The stellar photosphere-hydrogen ionization front interaction in classical pulsators: a theoretical explanation for observed period-colour relations, *Monthly Notices of the Royal Astronomical Society*, 493(1), pp. 29.

Das, S., Kanbur, S.M., Smolec, R., Bhardwaj, A., Singh, H.P., Rejkuba, M. (2021). A theoretical framework for BL Her stars - I. Effect of metallicity and convection parameters on period-luminosity and period-radius relations, *Monthly Notices of the Royal Astronomical Society*, 501(1), pp. 875.

Dewan, S., Tomar, M., Tandon, R.P., Gupta, V. (2020). Room temperature electroluminescence from Laser MBE grown Gallium nitride LEDs, *Materials Science and Engineering B: Solid-State Materials for Advanced Technology*, 260, pp. 114655.

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Dubey, M., Kumar, A., Murugavel, S., Vijaya Prakash, G., Amilan Jose, D. and Mariappan, C. R. (2020). Structural and ion transport properties of sodium ion conducting Na2MTeO6 (M= MgNi and MgZn) solid electrolytes, *Ceramic International*, 46, no. 1, pp. 663.

Dutt, M., Kaushik, A., Tomar, M., Gupta, V., Singh, V. (2020). Synthesis of mesoporous α-Fe_2O_3 nanostructures via nanocasting using MCM-41 and KIT-6 as hard templates for sensing volatile organic compounds (VOCs), *Journal of Porous Materials*, 27(1), pp. 285.

Dutt, M., Ratan, A., Tomar, M., Gupta, V., Singh, V. (2020). Mesoporous metal oxide–α-Fe_2O_3 nanocomposites for sensing formaldehyde and ethanol at room temperature, *Journal of Physics and Chemistry of Solids*, 145, pp. 109536.

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Gopal, K., Gupta, D.N., Suk, H. (2021). Pulse-Length Effect on Laser Wakefield Acceleration of Electrons by Skewed Laser Pulses, *IEEE Transactions on Plasma Science*, 49 (3), pp. 1152.

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Gupta, K.K., Jha, A.K., Singh, S.S. (2020). Quark-Gluon Plasma evolution under loop correction, *International Journal of Science Research and Applied Physics*, 8, pp. 13.

Gupta, R., Gupta, V., Tomar, M. (2020). Ferroelectric PZT thin films for photovoltaic application, *Materials Science in Semiconductor Processing*, 105, pp. 104723.

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Gupta, S., Pal, M., Tomar, M., ..., Bhalla, A., Gupta, V. (2021). Ferroelectric and magnetic domain mapping of magneto-dielectric Ce doped $BiFeO_3$ thin films, *Journal of Alloys and Compounds*, 882, pp. 160698.

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4. Journals

Prof. Sanjay Jain

- Editorial Board Member: Journal of Artificial Life (MIT Press).

Prof. Debajyoti Choudhury

- Associate Editor: Pramana, Journal of Physics (Indian Academy of Sciences).

Prof. Patrick Das Gupta

- Editorial Board Member: Resonance - Journal of Science Education (Indian Academy of Sciences).

Prof. Shyama Rath

- Guest Editor: Special Issue on Structure-property Relationships in Emerging Two-dimensional Materials, Journal of Materials Research (Springer).

Prof. Awadhesh Prasad

- Editor: Chaos, Solitons and Fractals (Elsevier Science).
- Associate Editor: Pramana, Journal of Physics (Indian Academy of Sciences).

Prof. Supriya K. Kar

- Editor: Journal of Astrophysics & Aerospace Technology, LA, USA.

Prof. S. Somorendra Singh

- Editorial Board Member: International Journal of Scientific Research in Physics and Applied Physics, ISROSET, Indore, India.

Dr. Devki Nandan Gupta

- Academic Editor, Laser and Particle Beams, Jointly published by Hindawi and Cambridge Press (UK).

5. Research Projects

S. No.	Project Title	Year/ Period	Funding Agency	Sanctioned Amount
01	Indian Institutions – Fermilab Collaboration in neutrino physics	2019-24	DST	Rs. 280.71 Lakhs

02	Pre-evolutionary processes in autocatalytic RNA networks	2018-2021	CEFIPRA (Indo-French)	Rs. 17.73 Lakhs
03	Centre of Excellence in Genome Sciences and Predictive Medicine (Phase II)	2015-20	DBT	Rs. 32.85 Lakhs
04	Probing New Physics Interactions	2019-22	SERB – DST	Rs. 75 Lakhs
05	Magneto-Optic and Plasmonic Response in magnetic core-shell structures and magnetic multilayers	2017-21	SERB – DST	Rs. 67.41 Lakhs
06	The role of spacer layer in exchange-coupled bi-phased magnetic multilayers and nano-composites	2020-21	SERB – DST	Rs. 20.81 Lakhs
07	Galactic & Extragalactic Archeology using Variable Stars	2019-22	CSIR	Rs 20 Lakhs
08	Theoretical Analyses of Variable Star Data in the era of Large Surveys	2018-21	DST (Indo-US joint network)	Rs. 60 Lakhs
09	Fabrication of Lamb Wave Devices on SiO2/Si	2019-24	ER & IPR	Rs. 428.03 Lakhs
10	Optimization of TiOx film and patterning of the polymer (PI-2610) as sacrificial layer for pixel fabrication	2018-21	DRDO	Rs. 22.19 Lakhs
11	Magnetic Fields as Probes for Astrophysical Phenomena	2017-20	SERB – DST	Rs. 25 Lakhs
12	Generation and Assessment of Optically Addressable Point Defects in Silicon Carbide for new quantum Technologies	2021-24	SERB – DST	Rs. 42.6 Lakhs
13	Fingerprinting of point defects in silicon carbide created by energetic particles for their relevance in quantum technologies	2021-23	DST (Indo-Japan)	Rs. 9.64 Lakhs
14	Fabrication and Assessment of the electrical and optical quality of ZnMgO films for visible-blind UV photodetectors	2021-22	Institute of Eminence, Delhi University	Rs. 5 Lakhs
15	Fabrication and characterization of piezoelectric nanocrystals-organic hybrid sheet for energy harvesting and pressure sensor	2016-20	SERB – DST	RS. 72 Lakhs
16	Functional Domains and Site Correlation Networks in Evolving Protein Families	2017-20	SERB – DST	Rs. 23.83 Lakhs
17	Low Cost Energy Saving Electrochromic Devices Based on Nanostructured Conducting Polymers for Energy Storing Smart Windows	2017-20	SERB – DST	Rs.39.5 Lakhs
18	Compact Muon Solenoid (CMS) Upgrade, Operation and Utilization	2014-20	DST	Rs. 1173 Lakhs
19	Updating and Operation of Regional WLCG Grid System	2014-20	DST	Rs. 25.3 Lakhs
20	Polymer composites for energy devices: Structure-property relationship	2017-20	Alexander von Humboldt Foundation, Germany	Rs. 45.42 Lakhs
21	Multi-nucleon transfer reaction dynamics and its effect on fusion near	2019-22	SERB – DST	Rs. 41.75 Lakhs

	the Coulomb barrier for medium mass nuclei			
22	Development of Flexible-Solid-State Capacitors based on Sodium Ion Conducting Gel Polymer Electrolytes 2017 – 2020 (completed)	2017-20	SERB – DST	Rs. 57.95 Lakhs
23	Development of solid-state carbon supercapacitors based on redox-active gel polymer electrolytes	2020-21	Institute of Eminence, Delhi University	Rs. 2.5 Lakhs
24	Understanding the perpetual points in nonlinear dynamical systems	2017-20	SERB – DST	Rs. 23 Lakhs
25	Search for large Octupole collectivity and high-spin near N=126 shell closure	2019-29	UGC-DAE-CRS Kolkata, India	Rs. 13 Lakhs
26	Investigation of the high spin states in the A=85 mass region using Ion-beam gamma-ray spectroscopy	2017-21	IUAC – UGC	Rs 6 Lakhs
27	Lifetime measurement study of octupole deformation in neutron deficient nuclei in Xe-Cs-Ba region	2018-21	IUAC – UGC	Rs. 10.11 Lakhs
28	Search for Quadrupole and Octupole collectivity in nuclei of mass A~150 region	2019-22	SERB – DST	Rs. 23.14 Lakhs
29	Exploring molecular growth of hydrocarbons in slow (energy 1 keV or less) Ion-molecule collisions	2019-20	SERB – DST	Rs. 33.11 Lakhs
30	Simulation studies and tests to develop radiation tolerant silicon detectors for High luminosity colliders	2017-20	SERB – DST	Rs. 10.8 Lakhs
31	Application of neutron damage model for reliable performance of silicon sensors in present and future high energy physics experiments	2020-21	Institute of Eminence, Delhi University	Rs. 5 Lakhs
32	Electron and ion acceleration from laser-plasma interactions	2020-21	DST – DAAD	Rs. 9.64 Lakhs
33	Tunable radiation source from laser-plasma based nonlinearities	2015-2020	DST & Russian Foundation of Basic Research	Rs. 15.98 Lakhs
34	Compact “Table-top” powerful terahertz source by laser-matter interactions and some applications	2020-22	DST & Russian Foundation of Basic Research	Rs. 26 Lakhs
35	Plasmonic Dimer Nanostructures	2020-21	Institute of Eminence, Delhi University	Rs. 2.5 Lakhs
36	To Design and Develop a novel spin controlled chiral quantum dot DNA bio-sensor	2019-22	SERB – DST	Rs. 17.71 Lakhs
37	Development of spin dependent smart electrode for DNA bio-sensor	2019-22	IMPRINT 2, MHRD – DST + Industry	Rs. 32.45 Lakhs
38	Development of electrochemical bent shaped DNA	2020-21	Institute of Eminence, Delhi University	Rs. 2.5 Lakhs
39	Depth resolved investigations of microstructures of metal/topological insulator interfaces	2020-23	UGC-DAE CSR and RRCAT, Indore, India	Rs. 1.35 Lakhs
40	Growth of periodic multi-bi-layer structures of high Z metals on the surface of three dimensional topological insulators	2019-20	SERB – DST	Rs. 29.15 Lakhs

6. Seminars Organized

Total Number: 49

- Dr. Suprit Singh, University of New Brunswick, Canada and IIT Delhi, India, About Processes-Natural & Artificial, 27 April 2020.
- Dr. Pranjal Trivedi, Hamburg University, Germany, Primordial Magnetic Fields and the Early Universe Dynamo, 25 May 2020.
- Dr. Buddhachandra Khundrakpam McGill University, Canada, Understanding brain development: Implications for neuro developmental disorders, 29 June 2020.

7. Seminar/Conference Presentations (National/International)

International

- Deo, N., Invited Webinar entitled "Quantum Inspired Tensor Networks for Financial Systems", International Conference on Artificial Intelligence in Complex Socio-Economic Systems and Public Policy, Centre for Complexity Economics, Applied Spirituality and Public Policy (CEASP), Jindal Global University, 21 January 2021.
- Gupta, D. N., Invited Webinar entitled "Laser wakefield acceleration of electrons by a circularly polarized laser pulse", The Asian Forum for Accelerators and Detectors (AFAD), organized by Budker Institute of Nuclear Physics (BINP), Novosibirsk, Russia, 16 March 2021.
- Gupta, D. N., Invited Webinar entitled "Control and optimization of electron beam characteristics in laser wakefield acceleration in plasmas", 4th Asia-Pacific Conference on Plasma Physics (AAPPSDPP2020), 26 October 2020.
- Kumar, Suresh, Invited Webinar entitled "Interplay of nucleon orbitals in nuclear structure: coupling schemes and band-crossing of dipole bands", International conference on Theoretical Aspects of Nuclear Physics, Department of Physics and Astronomical Sciences, Central University of Himachal Pradesh, Dharamshala, 15 February 2021.
- Kumar, Binay, Invited Webinar entitled "Growth of Functional Bulk- and Nano-Crystals for Energy Harvesting", 3rd International Workshop on Characterization and Analysis of Nanomaterials, University of Aveiro, Portugal, 3 February 2021.
- Kumar, Binay, Invited Webinar entitled "Nanoparticles and Single Crystals for Piezoelectric Green Energy", International Webinar on Quantum Materials and Nanoparticles for Advanced Applications, Kamraj College, Tamil Nadu, India, 6 August 2020.
- Kumar, Binay, Invited Webinar entitled "Piezoelectric Crystals and Nanoparticles for Energy Harvesting Applications", International Webinar on Materials Synthesis and Characterization (IWMAC), organized Jointly by Avadh University, Ayodhya, India and Florida Polytechnic University, USA, 11 July 2020.
- Kumar, Binay, Plenary Webinar entitled "Piezoelectric Nanoparticles Based Flexible Nanogenerators", 3rd International Conference on Nanomaterials Science and Mechanical Engineering, University of Aveiro, Portugal, 7 July 2020.
- Mahapatro, A. K., Invited Webinar entitled "Graphene Derivatives as Test Bed for Bio-entity Detection", International virtual conference on Strategies of self-dependency in Covid-19 and application of Exotic materials in the field of Physics, Chemistry, Biology, Medicine and Engineering, Veer Kunwar Singh University, Ara and SVP College in association with the Society for Technologically Advanced Materials of India (STAMI), 29 May 2020.
- Mahapatro, A. K., Invited Webinar entitled "Implementation of Graphene Derivatives in Engineering and Technology", International web conference on Science, Engineering and Technology (IWCSET-2020), organized by the Society for Technologically Advanced Materials of India (STAMI), 15 May 2020
- Mandal, S., Invited Webinar entitled "Femto Physics: It's Applications & Challenges", International webinar on Physics, organized by the Department of Physics, Pabna University of Science & Technology, Pabna, Bangladesh, 13 Nov 2020.
- Rath, S., Invited Webinar entitled "1.2D Nanomat-2021", International Conference on Recent Trends in 2D Nanomaterials, Amity University, Mumbai, India, 24 February 2021.

National

- Annapoorni, S., Invited Webinar on "Solid State Physics", National Academy of Sciences (NASI) Learning Physics – Delhi Chapter, India, 8 October 2020.
- Choudhary, B. C., Invited Webinar entitled "LHC an Overview & India's Contributions (How to unravel the mystery of the Universe with Accelerators, Detectors & Physics?)", National Academy of Sciences (NASI) Learning Physics – Delhi Chapter, India, 25 August 2020.
- Gupta, P. D., Invited Webinar Series on "Quantum Mechanics", National Academy of Sciences (NASI) Learning Physics – Delhi Chapter, India, 2 - 6 September 2020.
- Hashmi, S. A., Invited Webinar Series on "Atomic Physics", National Academy of Sciences (NASI) Learning Physics – Delhi Chapter, India, 27 - 29 September 2020.
- Kar, S., Invited Webinar entitled "Nobel Prize 2020 in Physics: Massive Black Hole Formation", delivered at Feynmania 2021 Annual Fest, ARSD College, University of Delhi, India, 23 March 2021.
- Kumar, Binay, Invited Webinar entitled "Growth of Single Crystals by Various Techniques for Optical, Piezoelectric and Communication Applications" 29th DAE-BRNS National Laser Symposium, RRCAT Indore, India, 12 February 2021.
- Kumar, Binay, Invited Webinar entitled "Technologically Important Crystals for Research & Applications", Central University of South Bihar, Gaya, Bihar, India, 27 June 2020.
- Kumar, Binay, Invited Webinar entitled "Single Crystals for Multifunctional Applications", Virtual Symposium on Multi-Functional Materials, SRM Institute of Science & Technology, Ramapuram, Chennai, India, 17 June 2020.
- Kumar, Binay, Invited Webinar Series on "Understanding Crystals for Society, Science and Devices", Indian Summer School on Crystal Growth (ISSCG-2020), organized by SSN Institutions, Chennai, India, 14-23 May 2020.
- Kumar, P.S., Invited Webinar Series on "Solid State Physics", National Academy of Sciences (NASI) Learning Physics – Delhi Chapter, India, on 21 - 26 September 2020.
- Mahapatro, A. K., Invited Webinar entitled "Utilization of Graphene Oxide in Nanoelectronics and Bio-sensors", Conference on Advanced Nanomaterials and their Applications – V, National Institute of Technology, Manipur, India, 23 November 2020.
- Mandal, S., Invited Webinar Series on "Nuclear Physics", National Academy of Sciences (NASI) Learning Physics – Delhi Chapter, India, on 16 - 19, 23, 24 and 28 August 2020.
- Naimuddin, M., Invited Webinar entitled "The Elusive Neutrinos: How elusive it can be?", CMHEP conference, ECC, Allahabad, India, 5 March 2021.
- Naimuddin, M., Invited Webinar on "GEM Detectors - Development, Application and Current Status of Indian Efforts", DAE HEP symposium, NISER, Bhubaneshwar, India, 14 December 2020.
- Naimuddin, M., Invited Webinar on "The Elusive Neutrinos", delivered as a part of the National Webinar Lecture Series on Advancement and Innovations in Modern Physics, 8 August, 2020.
- Roy, S. Invited Webinar Series on "Solid State Physics", National Academy of Sciences (NASI) Learning Physics – Delhi Chapter, India, on 21, 22, 24 and 25 September 2020.
- Seshadri. T. R., Invited Webinar Series on "Classical Mechanics", National Academy of Sciences (NASI) Learning Physics – Delhi Chapter, India, on 20 - 23, 25 and 27 August 2020.
- Sur, S., Invited Webinar Series on "Electromagnetic Theory", National Academy of Sciences (NASI) Learning Physics – Delhi Chapter, India, on 5, 7 - 10 October 2020.

8. Other Inter-Institutional Collaboration

International

B. C. Choudhary

- India-CMS Collaboration at CERN, Geneva, Switzerland, Fundamental Research
- NOvA Collaboration, Fermilab, USA, Fundamental Research.

Kirti Ranjan

- Indo-Italy Collaboration on Detectors, High Energy Physics Research,
- India-CMS Collaboration at CERN, Geneva, Switzerland, Fundamental Research

Nivedita Deo

- Research Collaboration on Research on Protein Networks, Institute of Fundamental Studies, Naresuan University, Thailand

Shyama Rath

- Collaborative Research, Departamento de Física Atómica, Molecular, Nuclear, Facultad de Física, University of Sevilla, Spain
- Collaborative Research, Physics Department, University of Torino and INFN, Torino, Italy,
- Collaborative Research, Department of Physics, University of Surrey, Guildford, Surrey, United Kingdom
- Collaborative Research, Center for Accelerator Science, ANSTO, Australia
- Collaborative Research, Sandia National Laboratories, Radiation-Solid Interactions, Albuquerque, NM, USA
- Collaborative Research, Intl. Atomic Energy Agency, Vienna, Austria

Vinay Gupta

- Collaborative Research with Prof. A. P. Freundorfer and Prof. M. Sayer, Queens Univ., Kingston, Canada.

H. P. Singh

- Indo-US Collaboration with Nodal Institute: Delhi University, India, Theoretical Astrophysics Research,

Smait Kr. Mandal

- FAIR Collaboration, GSI, Germany, Nuclear Physics Research
- AGATA Collaboration, European Union, Nuclear Physics Research.
- PRESPEC Collaboration, GSI, Germany, Nuclear Physics Research.

D. N. Gupta

- Experimental Research using GPU based high-speed computing and petawatt laser facilities, Strathclyde University, Glasgow
- Collaborative Research on Laser-plasma interaction, Gwangju University of Science and Technology (GIST), Gwangju, South Korea.
- Collaborative Research on Terahertz radiation generation, Sternberg Astronomical Institute of Moscow State University.

Ajit Kr. Mahapatro

- Collaborative Research with Prof. Y-R Ma and Prof. Y-K Cuo, Department of Physics, National Dong Hwa University, Hualien, Taiwan

Ashutosh Bhardwaj

- CMS Experiment RD50 Collaboration, High-energy Physics research

Ashok Kumar

- CMS Experiment RD50 Collaboration, High-energy Physics research

M. Naimuddin

- CMS Experiment RD50 Collaboration, High-energy Phsyics research

S. Sur

- Quantum Gravity and Cosmology Research with Prof. Saurya Das, Department of Physics and Astronomy, University of Lethbridge, Alberta, Canada

National

Shyama Rath

- Collaborative academic works as a panelist in hosting foreign students at Delhi University, Indian Council for Cultural Relations (ICCR), India.
- Collaborative Research, Solid State Physics Lab, DRDO, New Delhi, India.
- Collaborative Research, NPL, New Delhi, India.
- Collaborative Research, Inter-University Accelerator Centre (IUAC), New Delhi, India.
- Collaborative Research, National Chemical Laboratory, Pune, India.
- Collaborative Research, Institute of Physics, Bhubaneswar, India.

Vinay Gupta

- Collaborative Research with Dr. A. Kapoor, Solid State Physics Lab, DRDO, New Delhi, India.
- Collaborative Research with Dr. G. Gupta and Dr. A. Kumar, NPL, New Delhi, India.

Samit Kr. Mandal

- INO Collaboration, India, High Energy Physics Research.
- INGA Collaboration, India, High Energy Physics Research.

Jyoti Rajput

- Joint Research Project, Inter-University Accelerator Centre (IUAC), New Delhi, India.

Ajit Kr. Mahapatro

- Collaborative Research with Dr. S. P. Singh, NPL, New Delhi, India.
- Collaborative Research with Prof. S. Ghosh, JNU, New Delhi, India
- Collaborative Research with Prof. T. Basu, AMITY, Noida, India
- Collaborative Research with Dr. P. Poddar, NCL, Pune, India.

S. Roy

- Experimental Research using central facilities and large equipments, UGC-DAE CSR, Indore, India.

9. Number of M.Phil./Ph.D. Degrees Awarded

Ph.D.: 28

10. Faculty Strength

Permanent: 38
UGC-FRP: 02

11. Other Significant Information

Annual Raman Ramkumar memorial award in computational physics for meritorious MSc students.

Head/Director's Signature
Seal of Department/Centre/Institution