

Sanjay Prasad Pattnaik, Ph.D., M.Phil., M.Sc.,

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Professional Profile|2024

Education

- **Ph.D. (Physics, Specialization: Nuclear Physics/Nuclear Astrophysics)**
School of Physics, Sambalpur University, India
Supervisor: Prof. T. R. Routray, Professor of Physics, School of Physics, Sambalpur University
Thesis Title: "A Concise study of finite nucleus and dense isospin asymmetric nuclear matter with finite range simple effective interaction"

- **M.Phil. (Physics, Specialization: Nuclear Physics/Nuclear Astrophysics)**
School of Physics, Sambalpur University, Odisha, India
Guide: Prof. (Dr.) T. R. Routray, Professor of Physics, School of Physics, Sambalpur University
Co-Guide: Prof. (Dr.) D. N. Basu, Variable Energy Cyclotron Center, 1/AF Bidhan Nagar, Kolkata, 700064, India
Thesis Title: "Photon And Neutron Induced Nuclear Reactions of Actinides At intermediate Energies"

- **M.Sc. (Physics, Specialization: Nuclear Physics)**
School of Physics, Sambalpur University, Odisha, India
FIRST POSITION IN FIRST CLASS (Double Gold Medallist)

- **B.Sc. (Honours in Physics)**
Govt. College, Sundargarh, Sambalpur University, Odisha, India
First Class Hons. With Distinction

Professional Experience

- Lecturer in Physics at Govt Women's College, Sambalpur 12.12.2023 tilldate).
- Lecturer in Physics at Govt Women's College, Sambalpur (From 01-09-2023 to 11.12.2023).
- Lecturer in Physics at Department of Higher Education, Govt of Odisha, Bhubaneswar (Extension of Joining Period) (From 11-08-2023 to 31-08-2023).
- Lecturer in Physics at GM Jr College, Sambalpur /G.M. H. S. School Sambalpur (From 12-12-2021 to 10-08-2023).
- Jr. Lecturer in Physics at GM Jr College, Sambalpur /G.M. H. S. School Sambalpur (From 13-11-2016 to 11-12-2021).
- Jr. Lecturer in Physics at Govt College, Sundargarh (From 12-12-2013 to 12-11-2016)
- Lecturer in Physics (Contractual) in VSSUT, Burla (for 3 semesters in 2011-2012)

Subjects/Papers Taught

- PG
 - PHY-412 (Quantum Mechanics and Applications (I)) (Theory)
 - PHY-414 (Computer Programming) (Theory)
 - PHY-415 (Computer Practical (I))
 - PHY-421 (Electrodynamics) (Theory)
 - PHY-422 (Quantum Mechanics and Applications (II)) (Theory)
 - PHY-424 (Statistical Mechanincs) (Theory)
 - PHY-425 (Computer Practical (II))
 - PHY-511 (Solid State Physics) (Theory)
 - PHY-513 (X-ray and Laser Spectroscopy) (Theory)

- PHY-514 (Research Methodology) (Theory)
- PHY-521 (Nuclear Physics) (Theory)
- PHY-522 (Particle Physics) (Theory)

➤ UG

- Core Course-II (Classical Mechanics) (Theory)
- Generic Elective -1 (GE-1) (Theory)
- Core Course-V Practical (Mathematical Physics-II Lab)
- Core Course-VII Practical (Mathematical Physics-III Lab)
- Generic Elective -4 (GE-4) (Theory)
- Core course-XI (Quantum Mechanics & Applications) (Theory)
- Core Course-XI Practical (Quantum Mechanics Lab)
- Core course-XII (Solid State Physics) (Theory)
- Discipline Specific Elective -2 (DSE-2) (Theory)
- Core course-XIV (Statistical Mechanics) (Theory)
- Core Course-XIV Practical (Statistical Mechanics Lab)

➤ Class XI/ XII

- Physics- XI (Theory & Practical)
- Physics-XII (Theory & Practical)

Honours and Awards

- **Qualified GATE (Graduate Aptitude Test in Engineering)** with an All India Rank (AIR) of 242, India.
- **Qualified JEST (Joint Entrance Screening Test)** with an All India Rank (AIR) of 146, India.
- **Selected for INSPIRE Fellowship** – Shortlisted under the *Innovation in Science Pursuit for Inspired Research* program by the Department of Science & Technology, Government of India.
- **University Gold Medalist** – Secured First Position in First Class in the Master of Science (Physics) Examination.
- **Dillip Kumar Pati Gold Medal** – Recognized as the Best Postgraduate Regular Student for achieving First Position in First Class in the Master of Science (Physics) Examination.
- **Best Student Award** – Received the Best Student Award from Hemgir High School, Hemgir, Sundargarh, Odisha, India.
- **Qualified Science Aptitude & Talent Search Test** – Conducted by the All India Science Teachers' Association.
- **Qualified National Rural Talent Search (NRTS) Examination, India.**

Research Interest

- Nuclear Physics (Theory).
- Nuclear Astrophysics (Theory).

Publications

i. Publications in International Journals:

1. Correlations between charge radii differences of mirror nuclei and stellar observables, 2023, Phys. Rev. C **108** 015802, P. Bano, **S. P. Pattnaik**, M. Centelles, X. Viñas, and T. R. Routray.
(DOI: <https://doi.org/10.1103/PhysRevC.108.015802>)
2. Influence of direct Urca on the r-mode spin down features of newborn neutron star pulsars, 2021, Phys. Scr. **96** 045301, T R Routray, **S P Pattnaik**, C Gonzalez-Boquera, X Viñas, M Centelles and B Behera.
(DOI: 10.1088/1402-4896/abdb53 or <https://iopscience.iop.org/article/10.1088/1402-4896/abdb53>)
3. Half-lives of proton emitters studied with the KDE0v1 Skyrme interaction Madhuri K, Basu D N, Routray T R, and **Pattnaik S P** 2020, *Indian J Phys.*
(DOI: <https://doi.org/10.1007/s12648-020-01801-8>)
4. Addendum: Influence of the nuclear matter equation of state on the r-mode instability using the finite-range simple effective interaction (2018 J. Phys. G: Nucl. Part. Phys. **45** 055202), J. Phys. G: Nucl. Part. Phys. **45** (2018) 119401 (6pp), **S P Pattnaik**, T R Routray, X Viñas, D N Basu, M Centelles, K Madhuri and B Behera.
(DOI: 10.1088/1361-6471/aae142 or <https://iopscience.iop.org/article/10.1088/1361-6471/aae142/meta>)
5. “Influence of the nuclear matter equation of state on the r-mode instability using the finite-range simple effective interaction”, J. Phys. G: Nucl. Part. Phys. **45** (2018) 055202 (30pp), **S P Pattnaik**, T R Routray, X Viñas, D N Basu, M Centelles, K Madhuri and B Behera.
(DOI: 10.1088/1361-6471/aab7c5 or <https://iopscience.iop.org/article/10.1088/1361-6471/aab7c5>)
6. Crustal moment of inertia of glitching pulsars with the KDE0v1 Skyrme Interaction Madhuri K, Basu D N, Routray T R, and **Pattnaik SP** 2017, *Eur. Phys. J. A* **53** 151.

(DOI: <https://doi.org/10.1140/epja/i2017-12338-x>)

7. “Exact versus Taylor-expanded energy density in the study of the neutron star crust–core transition”, J. Phys. G: Nucl. Part. Phys. **43** (2016) 105101 (30pp), T R Routray, X Viñas, D N Basu, **S P Pattnaik**, M Centelles, L B Robledo and B Behera.

(DOI: 10.1088/0954-3899/43/10/105101 or <https://iopscience.iop.org/article/10.1088/0954-3899/43/10/105101>)

8. “Deformation properties with a finite-range simple effective interaction”, J. Phys. G: Nucl. Part. Phys. **43** (2016) 045115 (18pp), B Behera, X Viñas, T R Routray, L M Robledo, M Centelles and **S P Pattnaik**.

(DOI: 10.1088/0954-3899/43/4/045115 or <https://iopscience.iop.org/article/10.1088/0954-3899/43/4/045115>)

ii. Publications in National/International Seminar/Symp. etc. Proceedings / Bulletins:

1. “Bulk viscosity of Hot Neutron star Matter”, **Proceedings of the DAE Symp. on Nucl. Phys. (2024)**, **Sanjay Prasad Pattnaik**, Sangeeta Sahoo, K Madhuri and Tusar Ranjan Routray.
2. “Equation of State of Isentropic Hot Neutron Star Matter”, Proceedings of the DAE Symp. on Nucl. Phys. (2024), **Sangeeta Sahoo, Sanjaya Prasad Pattnaik and Tusar Ranjan Routray**.
3. “Gravitational waves and the Indian Knowledge System”, Proceedings of Odisha State Higher Education Council. Govt Of Odisha, sponsored National Seminar **23** (2024), **S. P. Pattnaik**, K. Madhuri, S. Sahoo, S. K. Panda, T. R. Routray.
4. “Convergence of Ancient Wisdom with Modern Science: Machine Learning an Advance Tool to pursue Modern Physics”, Proceedings of Odisha State Higher Education Council. Govt Of Odisha, sponsored national seminar **22** (2024), R.K. Sahoo, **S. P. Pattnaik**, K. Madhuri, R K Biswal and S Sahu.

5. “Equation of State of Hot Neutron Star Matter”, Proceedings of the DAE Symp. on Nucl. Phys. **67** 793 (2023), Sangeeta Sahoo, **Sanajay Prasad Pattnaik**, Parveen Bano, Zashmir Naik, Santanu Kumar Padhihari, K Madhuri and Tusar Ranjan Routray.
6. “Shear Viscosity in Pulsar Neutron Stars using Skyrme KDE0v1 interaction”, Proceedings of the DAE Symp. on Nucl. Phys. **67** 827 (2023), K Madhuri, **Sanjay Prasad Pattnaik**, Sangeeta Sahoo, Santanu Kumar Padhiari and Tusar Ranjan Routray.
7. “Bulk Viscosity of Superfluid Neutron Star under URCA Reactions”, Proceedings of the DAE-BRNS Symp. on NRSIC-23, **33** (2023), S K Padhiari, **S P Pattnaik**, K Madhuri, T R Routray.
8. “The Fractional moment of inertia of neutron star crust and Pulsar Glitches”, Proceedings of the DAE-BRNS Symp. on NRSIC-23, **32** (2023), P Bano, **S P Pattnaik**, Z Naik, S Sahoo, T R Routray.
9. “Study of r-mode spin down features of new born neutron star pulsars using KDE0v1 interaction”, Proceedings of the DAE Symp. on Nucl. Phys. **66** 774 (2022), K. Madhuri, **S. P. Pattnaik**, S. K. Padhihari, and T. R. Routray.
10. “Bulk viscosity of superfluid Neutron Stars under the influence of Direct URCA and Modified URCA reactions”, Proceedings of the DAE Symp. on Nucl. Phys. **66** 770 (2022), **S. P. Pattnaik**, S. K. Padhihari, K.Madhuri and T. R. Routray.
11. “Study of finite nuclei and spindown properties of newborn neutron stars using Finite range Simple effective interaction”, Proceedings of the DAE Symp. on Nucl. Phys. **65** 490 (2021), P. Bano, **S. P. Pattnaik**, S. K. Tripathy, K. Madhuri, S. K. Padihari, and Z. Naik.
12. “The r-mode instability of the neutron star matter under the influence of URCA reactions”, Proceedings of the DAE Symp. on Nucl. Phys. **64** 576 (2019), T. R. Routray, **S. P. Pattnaik**, X. Viñas, D. N. Basu, M.Centelles and K. Madhuri.
13. “Role of Nuclear Matter Saturation Properties in the Predictions of Finite Nuclei Bulk Properties”, *Proceedings of the DAE Symp. on Nucl. Phys.* **63** 154 (2018), T. R. Routray, P. Bano, X. Viñas, M. Centelles, L. M. Robledo, **S. P. Pattnaik**.

14. “Bulk viscosity of the neutron star matter under the influence of Direct URCA reactions”, Proceedings of the DAE International Symp. on Nucl. Phys. **63** 812 (2018), **S. P. Pattnaik**, X. Viñas, D. N. Basu, M. Centelles, K. Madhuri, D. Behera, S. Pasayat, P. Bano, and T. R. Routray.
15. “Influence of transition density calculated by thermodynamical method and dynamical method on crustal fraction of moment of inertia of neutron star using Rsigma and Gsigma Skyrme interaction”, Proceedings of the DAE International Symp. on Nucl. Phys. **63**, 778 (2018), K. Madhuri, T.R. Routray, D.N. Basu, **S.P. Pattnaik**.
16. “Intensity of gravitational waves emitted by pulsar neutron stars due to r-mode oscillation”, Proceedings of the DAE International Symp. on Nucl. Phys. **63** 776 (2018), T R Routray, **S P Pattnaik**, X Vinas, D N Basu, M Centelles, K Madhuri, B Behera.
17. “Hyperon Puzzle with Simple Effective Interaction”, Proceedings of the DAE Symp. on Nucl. Phys. **62** (2017), P. Bano, T. R. Routray, **S. P. Pattnaik**, D. Behera, D. N. Basu, Z. Naik, S. Pasayat and B. Behera.
18. “Study of the effect of the slope parameter on the r-mode instability using Simple Effective Interaction”, Proceedings of the DAE Symp. on Nucl. Phys. **62** 692 (2017), **S P Pattnaik**, T R Routray , X Vinas, D N Basu, K Madhuri and B Behera.
19. “Inner crust of neutron stars with mass-fitted Skyrme interaction”, Proceedings of the DAE Symp. on Nucl. Phys. **62** 690 (2017), K Madhuri, D N Basu, T R Routray and **S P Pattnaik**.
20. “Properties of nuclear matter and finite nuclei with finite range simple effective interaction”, *EPJ Web of Conferences* **117** 07009 (2016), T R Routray, X Vinas, M Centelles, L M Robledo, **S P Pattnaik** and B Behera.
21. “Fission half-life calculation using simple effective interaction”, Proceedings of the DAE-BRNS Symp. on Nucl. Phys. **61** 90 (2016), L. M. Robledo, T.R. Routray, X. Viñas, **S. P. Pattnaik**, M. Centelles and B. Behera.
22. “Validity of parabolic approximation in the study of crust-core transition density using Skyrme interaction”, Proceedings of the DAE-BRNS Symp. on Nucl. Phys **61** 922 (2016), K Madhuri, **S P Pattnaik**, T R Routray, D N Basu and B Behera.

23. “Taylor expansion in the study of neutron star crust-core transition density”, Proceedings of the DAE-BRNS Symp. on Nucl. Phys **61** 884 (2016), T R Routray, X Vinas, D N Basu, **S P Pattnaik**, M Centelles, L M Robledo, K Madhuri and B Behera.
24. “Properties of nuclear matter and finite nuclei with finite range simple effective interaction”, EPJ Web of Conferences **117** 07009 (2016) T.R. Routray, X. Vinas, M. Centelles, L Robledo, **S P Pattnaik** and B Behera.
25. “Importance of the fourth-order terms of energy in the Taylor series expansion of neutron star crust-core phase transition”, Proceedings of UGC sponsored national seminar on Advance in Physics During the Half Century and its application to society **96** (2016), **S.P. Pattnaik**, K. Madhuri
26. “Influence of nuclear matter fourth-order symmetry energy on neutron star crust-core phase transition”, Proceedings of the DAE-BRNS Symp. on Nucl. Phys **60** 864 (2015) T.R. Routray, **S.P. Pattnaik**, X. Vinas, M. Centelles, K. Madhuri, B. Behera.
27. “Spin Polarized Nuclear Matter and Finite Nuclei with Simple Finite Range Effective Interaction”, Proceedings of the DAE-BRNS Symp. on Nucl. Phys **59** 468 (2014) T.R. Routray, **S.P. Pattnaik**, K. Madhuri, T.M. Sahu, B. Behera.

Seminars / Conferences / Workshops Attended

1. 63rd DAE DAE-BRNS Symposium on Nuclear Physics (2018).
2. 62nd DAE DAE-BRNS Symposium on Nuclear Physics (2017).
3. 61st DAE DAE-BRNS Symposium on Nuclear Physics (2016).
4. Seminar on Advances in Physics During the Last Half Century and Its Application to Society (2016), Organised by G.M. (Auto) College, Sambalpur.
5. 60th DAE DAE-BRNS Symposium on Nuclear Physics (2015).
6. 59th DAE DAE-BRNS Symposium on Nuclear Physics (2014).

Orientation/ Training Programme Attended

1. Higher Secondary School Teachers Training/Orientation programme organized by TDC, IISC Bangolere (2021).
2. Orientation Course of NSS Programme officer organized by NSS Empanelled Training Institute, OUAT, Bhubaneswar, Sponsored by Ministry of Youth Affairs and Sports, Govt. of India (2014).

Professional Affiliations

- Orissa Physical Society
- Indian Red Cross Society

Academic/ Administrative Responsibilities

- **Gov't Women's College, Sambalpur**
 - Co-Convenor of National Seminar organized by Department of Education in collaboration with Internal Quality Assurance Cell (IQAC), Government Women's College, Sambalpur, sponsored by Department Odisha State Higher Education Council. Govt Of Odisha, (2024),
 - Supervised project works of 6 number of MSc Students and 2 number of BSc Students (2023-2024).
 - Nodal Officer, NUA-O, Govt Women's College, Sambalpur (2023-2024).
 - OIC, College Website, Govt Women's College, Sambalpur (2023-2024).
 - OIC, Social Media, Govt Women's College, Sambalpur (2023-2024).
 - Associate Accounts Bursar, Govt Women's College, Sambalpur (2023-2024).
 - Member in Purchase committee, Govt Women's College, Sambalpur (2023-2024).
 - Member Science Society, Govt Women's College, Sambalpur (2023-2024).

- **G.M. H. S. School, Sambalpur (Erstwhile G.M. Jr College, Sambalpur)**
 - Dy Hub Supervisor, EMH, (AHSE-2023) at G.M. H. S. School, Sambalpur (2022-2023).
 - Admission in Charge at G.M. H. S. School, Sambalpur (2022-2023).
 - NSS Programme officer at G.M. H. S. School Sambalpur (2019-2022).
 - Assistant Admission in Charge at G.M. H. S. School, Sambalpur (2019-2021).
 - Dy. Superintendent of AHSE-2019 to AHSE- 2023 at G.M. H. S. School, Sambalpur.
 - Assistant Superintendent Boys Hostel, , G.M. H. S. School, Sambalpur (2021-2022).
 - Member of Residence committee, G.M. H. S. School, Sambalpur (2021-2022).
 - Member in Time-Table committee, G.M. H. S. School, Sambalpur (2020-2022).
 - Member in Purchase committee, G.M. H. S. School, Sambalpur (2020-2022).
 - Member in Examinations committee, G.M. H. S. School, Sambalpur (2019-2022).
- **Govt College, Sundargarh/ Govt Jr. College, Sundargarh**
 - Dy. Superintendent of AHSE-2015 and AHSE- 2016 at Govt College, Sundargarh.
 - Nodal Officer of Active Citizenship Programe, Govt College, Sundargarh (2015-2016).
 - OIC, College Website, Govt College, Sundargarh (2014-2016).
 - NSS Programme officer at Govt College, Sundargarh (2014-2016).

Professional Community Involvement

- Invited as Judge in the district level TECHNOFEST-2023, held at C.S.B. Zilla School, Sambalpur on 08.09.2023.
- Invited as Judge in the district level project/ideas Exhibition in Hackathon, held at Govt High School, Budharaja, Sambalpur on 10.02.2023.
- Invited as Chief Speaker on the occasion of Mathematics Competition on WORLD RAMANUJAN DAY on 28.01.2023, Organised by Sambalpur Zilla Baristha Nagarika Samaj.