
# ANNUAL REPORT
# &
# AUDITED STATEMENT OF ACCOUNTS
# 2018-19

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राष्ट्रीय विज्ञान शिक्षा एवं अनुसंधान संस्थान
NISER
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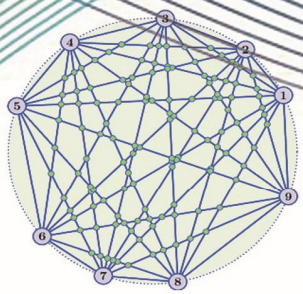

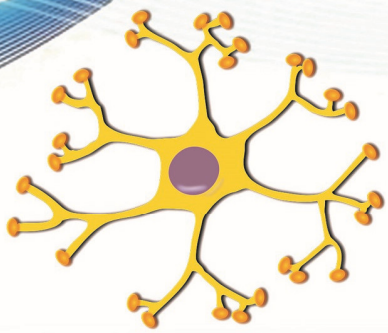

## राष्ट्रीय विज्ञान शिक्षा एवं अनुसंधान संस्थान भुवनेश्वर
## NATIONAL INSTITUTE OF SCIENCE EDUCATION AND RESEARCH BHUBANESWAR

# ANNUAL REPORT

&

## AUDITED STATEMENT OF ACCOUNTS

## 2018-2019


**NATIONAL INSTITUTE OF SCIENCE EDUCATION AND RESEARCH BHUBANESWAR**

AN AUTONOMOUS INSTITUTE UNDER DEPARTMENT OF ATOMIC ENERGY, GOVERNMENT OF INDIA

P.O.-Jatni, District - Khurda, Pin - 752050, Odisha, India

150
YEARS OF
CELEBRATING
THE MAHATMA

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**Shri K N Vyas,**

**Secretary, Department of Atomic Energy and Chairman , Atomic Energy Commission**

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**Chairman**

**Prof. Sudhakar Panda, Director, NISER Bhubaneswar**

## Present Members

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| Prof. M Mukund<br>*CMI, Chennai* | Mr. Chandan Mahish (PG)<br>*Student Representative (PG) - Invitee* |
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**Secretary**

**Dr. A. K. Naik**

*Registrar, NISER*

## FROM THE DIRECTOR'S DESK

***Knowledge is the most important thing without which one cannot achieve his goal.***

***---Rig Veda***

With the proud possession of the wisdom of the passing year and the promises of the one that beckons, I am delighted to present the Annual Report of National Institute of Science Education and Research (NISER) for the financial year 2018 -19.

The year 2018 -19 was an extremely meaningful one for NISER in terms of its unending endeavor of realizing the primary objective to train and nurture human resources in the areas of basic Sciences for the country's knowledge economy.

Since its inception, NISER has been consciously making efforts to create a niche in the scientific community. This year was no exception. The young and energetic faculty members delivered what they have been relentlessly doing to augment the environment of innovation and foster cutting edge research to meet the unique needs of the country. This is reflected in the quality and quantity of research publications, their participation in multilateral and bilateral research collaborations, participation in various academic and research forums and conferen ces, etc. Over the years NISER has been able to create excellent research facilities due largely to the generous funding that it receives from the Department of Atomic Energy. Some of the best and state -of-the-art ones are now just within an arm's reach al lowing our researchers to give wings to their imagination. The teaching and research laboratories of the schools of Physics, Chemistry, Mathematics and Biology have been well equipped to provide the students the required opportunities.

We are extremely pr oud of their academic fellowships and awards, publications in high impact journals, being invited talks, conference presentations, engagement in collaborative efforts with leading Universities abroad, etc. I would like to mention a few notable achievements of our faculty in the past year. In addition to the generous funding from the Department of Atomic Energy (DAE), extramural funding is also coming thick and fast from various sources underpinning our pursuit of research. We are extremely fortunate and tha nkful to DAE for the uninterrupted support. It gives me immense pleasure to note all these academic achievements in this annual report. During the financial year ending in March 2019, our faculty members have added twenty-two new sponsored projects with fu nding to the tune of Rs 7.30 crores from non -

DAE sources. Some of the major non-DAE sources include Dept. of Science and Technology (DST), Dept. of Biotechnology, (DBT) Science and Engineering Research Board (SERB) and Council of Scientific and Industrial Research (CSIR), etc.

Our students have always been our most prized possessions. Since NISER's inception, we have been trying to create, nurture and sustain an academic environment that can be compared with the best nationally and internationally. The gra duating class of 2018 have made us even prouder with their success stories. Most of the students of class of 2018 have enrolled for PhD programmes with fellowships from esteemed Universities and Institutes like, TIFR-Mumbai, TIFR-ICTS, TIFR-NCRA, TIFR-TCIS Hyderabad, IISc-Bangalore, IUCAA-Pune, etc. in India and Universities like Johns Hopkins, Michigan, California, NUS-Singapore, Ohio, Utah, Utah, Minnesota, Stony Brook, Penn State, Purdue, Georgia Tech, New York, Iowa, Wisconsin Madison, Illinois-Urbana Chapaign, Arizona, Christchurch, Max Plank Institute, etc abroad. Similarly, the graduating PhD students have secured post-doctoral fellowships from esteemed places like IISc Bangalore, Max Plank Institute, etc. This also reinforces the mandate that NISER is committed to create quality manpower for research in different areas of basic sciences.

The youthful and vibrant faculty members are relentlessly working towards taking research activities at NISER to newer heights. Interdisciplinary and cutting edge research have created an enviable synergy that is contributing immensely to the Institution building. I take this opportunity to thank each one of them for choosing to grow with this growing Institution and congratulate them for their persistent efforts i n bagging academic fellowships and awards, publishing in high impact journals, being invited for talks, attending conferences, engaging in collaborative research with leading Universities across the globe, etc.

At NISER, we recognize that innovative appr oaches and contribution to furthering the intellectual environment are the only keys to creating a niche in the global knowledge community. Keeping those in vision, we must uncompromisingly raise the bar and rise up to that. Transcending academic and intellectual boundaries, the students and research scholars are being nurtured in the ambiance of this scientific culture with a single-minded focus to contribute meaningfully to the growth and development of the country. Taking a step further and like in prev ious years, NISER organized its outreach programmes such as the Science Day, NISER Open day, Summer Outreach Programme in Mathematics, etc. also organized a score of International and National Seminars. The winter of 2018 also witnessed over one thousand y oung scientists showcase their sports talents and camaraderie in the Inter IISER-NISER sports Meet that was organized by NISER in its campus.

Last but not the least, I place on record a note of thanks to the editorial team in bringing out this comprehensive Annual Report. Their efforts are sincerely appreciated.

**Prof. Sudhakar Panda**

**DIRECTOR**

# ABOUT NISER

## The Institute

National Institute of Science Education and Research (NISER), is an initiative of the Government of India. The primary objective of the Institute is to train and nurture human resources in the Sciences for the knowledge economies of the future. This is in tune with a general shift in social and national thought that seeks to create new sites of knowledge production centered in our country.

Such a strategic shift in perspective has been necessitated by the realization that the unique circumstances of our nation demand unique scientific and pedagogic responses. Consequently, we are called upon to question and account for conventional categorizations of science, technology, environment, learning, innovation, design and being. The predominant discourse that seeks to structure these superficially hard categories is predicated on justifications that till date have not moved beyond regimes of hierarchy, control and access. These strictures are an inherent feature of "Institutionalized Science" where Newtonian principles of organizing domains of cognition and mechanisms of representation constrain debates on what new conceptualizations of science ought to be like. More problematically this stifles the potential for inter-disciplinary approaches of learning. This means we continue to think in and with straight jacketed binaries such as natural / artificial, real / virtual or being / thing. The fo unding of this Institute is rooted in the understanding that the contexts we inhabit are dynamic and in flux, while we have not begun to think in terms of solutions to most of these problems we realize that they exist and that we need to quickly participate in the process of finding out some answers.

NISER recognizes that modern scientific research is carried out in interstices amongst fuzzy domains and blurred boundaries. This entails encouraging a new scientific culture where members of our community attain to an intellectual agility unconstrained by the limitations of disciplinary conventions from the past. Faculty and Students will be given generous material support in the pursuit to realize this objective. Time and conversational space will be devoted to nascent propositions and hypothesis and the significantly small student-faculty ratio, an eventual full strength of 2000 students and 300 faculty members, manifests the Institutes investment and hope in the future.

# ACADEMIC OVERVIEW

To deliver on the promise NISER initiated efforts in 4 major areas of science by establishing School of Biological Sciences (SBS), School of Chemical Sciences (SCS), School of Mathematical (SMS) and School of Physical Sciences (SPS). A School of Humanities and Social Sciences (SHSS) has also been established to understand the positionality of science in a socio-cultural context.

At NISER, students are admitted for a 5 year Integrated MSc (iMSc) program or for a Ph. D program. In the Integrated M Sc program, students learn all core subjects in basic sciences and specific courses in the humanities in the first year, following which they select their stream of choice in the basic sciences. Each school has its own program of core and elective courses and a student can finally graduate with one major and two minors in the areas of their choice. NISER has also added two more schools, one in Computer Sciences (CS) and other one being Earth and Planetary Sciences (EPS). NISER has already started post-B.Sc Integrated Ph. D programme in Physics since 2016. Going forward, it will be extended to other schools as well.

NISER shifted from its transit campus at Institute of Physics, Bhubaneswar to its permanent campus at Jatni, Khurda and the Institute has been dedicated to the nation by Honorable Prime Minister of India Shri Narendra Modi on February 07, 2016. The permanent campus has over 850 students spread over five batches of students admitted to the flagship M. Sc programme through a Pan-Indian entrance test known as National Entrance Screening Test ( NEST). NISER also cariies out Doctoral Programme in all Basic Sciences and Humanities and Social Sciences.

## Curriculum

The academic curriculum, including the structure of courses, laboratory hours, emphasis to study interdisciplinary subjects etc. have been framed with a vision that NISER will provide strong foundations in subjects of specialization with a broad perspective in fundamental sciences.

In addition to the established programmes in Chemistry, Physics, Mathematics and Biology, NISER has initiated new programmes in Computer Science and Earth and Planetary Sciences. With the help of eminent scientists drawn from across the country, NISER has drawn a road map that will allow it progressively to initiate these new schools and their academic programmes.

NISER recognizes that modern scientific research is carried out in a domain transcending conventional academic boundaries. The undergraduate students and research scholars are being nurtured in the ambience of this scientific culture. Going forward, there would be many centres of research in inter-disciplinary areas opening more and bigger windows for cutting edge scientific research. NISER has started an integrated post-BSc PhD programme in Physics since Academic Session 2016-17. Going forward, NISER will extend the integrated PhD programme to other schools too.

## School of Biological Sciences

The School of Biological Sciences (SBS) is one of the major schools at NISER established in September 2007. Since its inception, SBS has bee n involved in mixing and imparting traditional wisdom with modern technology by developing a research programs along with a vibrant teaching curriculum. SBS promotes scholarly and innovative thinking to conduct cutting edge research in diverse areas rangin g from molecular to organismic biology. To facilitate the process, the school offers 5-year integrated MSc programme, Ph. D programme and Post-Doctoral programme to motivate and train students. SBS aims to establish as a center of excellence with its effort s grown up rapidly and signs of its achievements are being noticed at national and international levels in terms of work and student placements. To further strengthen the SBS research program, an Integrated Ph. D program initiative is under progress.

**The school is on a mission**

- To strive to become a centre of excellence in education and research in biological sciences providing training at undergraduate, graduate, doctoral and post -doctoral level.
- To provide effective interdisciplinary learning ambience thr ough extensive subject coverage in all fields of modern biology and inter -phasing with other scientific disciplines.
- To equip its students to keep pace with recent developments in the field of scientific research.
- To undertake high quality research activit ies in defined areas of biosciences so as to make an impact at national and international level.
- To impart professional training for skilled human resource development across the state and country through short term training courses.
- To strive to develop s tate of the art infrastructure comparable to best anywhere in the world.

**Facilities for Research and Teaching**

- Confocal Microscope Facility
- DNA sequencing and Surface Plasmon Resonance Facility
- Micro-array facilities for Genomics

## School of Chemical Sciences

Chemistry as a subject has considerable impact on our everyday lives and on other scientific disciplines. The aim of the School of Chemical Sciences at NISER is to impart high quality undergraduate and postgraduate level of knowledge to students coupled with cutting-edge research activity by the faculty and the students of the school. In addition to traditional organic, inorganic, physical and theoretical chemistry areas, the school embarks on teaching and research activity in the interface areas of Biolo gy, Material Sciences and Medicine. The teaching philosophy at NISER is not only to impart high quality training to students to make them talented and motivated scientific personnel but also to inculcate human values and concern for societal needs and environment. The School of Chemistry offers one of the best integrated M.Sc. programme as well as PhD programme. The syllabus for the integrated MSc programme is designed not only to teach basic principles but also to have hands on practical experience by research projects as a part of the curriculum. Till date, 104 integrated MSc students and 26 PhD

students have been graduated from the School. The Integrated MSc students are in BARC training school program, also pursuing research in various institutes in India as well as abroad. The PhD students are doing their postdoctoral research in abroad. Currently, 141 integrated MSc students and 105 PhD students are in School of Chemical Sciences.

**Facilities for Research and Teaching:**

- Microfocus single crystal X-ray Diffractometer

## School of Mathematical Science

The School of Mathematical Sciences (SMS) strives to become a citadel for mathematics and allied subjects in terms of teaching and research. The faculty of Mathematics has a strong penchant for acquiring and updating their knowledge and imparting it to the students. The undergraduate program in the school is carefully designed to train the students to acquire creative mind and analytical skills that are needed to pursue their career. SMS aspires to become the foremost center in the Ph. D. program in the forefront areas of Mathematics. In addition to formal courses and research, seminars are conducted regularly. In the seminars, outstanding mathematicians from throughout the world present their latest research findings in various fields of mathematics. SMS envisages to introduce strong curriculum in the fields of applied mathematics, financial mathematics and computer science so that students can take up prominent careers in financial/industrial establishments.

**The Curriculum of the School**

The curricula of SMS stresses interdependence and unified structure of science and at the same time emphasizes intensity of study in order to achieve a good understanding and skills in Mathematics. To fulfil this objective, a basic common core has been identified which constitutes the courses of the first two semesters. The courses on Mathematics in the 3rd semester onwards will focus on reading and understanding of mathematical proofs, emphasizing precise thinking and presentation of mathematical results both orally and in written form. The courses for the second and third year have been designed to provide an understanding of foundational level mathematics in the areas of logic, number theory, algebra, analysis, geometry, discrete mathematics and informatics. The students are encouraged to develop minor areas of interest in other streams of study by a system of open electives running up to the end of the sixth semester. The last four semesters have been reserved for advanced level courses and specialized courses. Provision has also been made for pursuing studies in special areas and writing an innovative project leading to a dissertation.

The aim and mission of the doctoral program in the School of Mathematical Sciences is to produce good and efficient scholars who will excel in acquiring and imparting good and deep knowledge in Mathematics. The program is carefully designed to understand mathematics both vertically and horizontally, that is, to obtain a fundamental understanding of basic fields of mathematics and a thorough state-of-the-art understanding of one major field of interest in which the student writes his thesis. Though the emphasis is placed on the abilities of the student recognizing significant research problems on their own and solving them, we create a sense of rapport between the students and the experts in the field, that is to say that an ambience is

created for the students to have the excitement and stimulation on their own but at the same time with support and mentoring provided by the teachers.

The Ph. D. degree is generally a four-year program culminating in an original piece of mathematical research for a thesis and eventual publications in good and scholarly journals. While the thesis is in a specific area, the coursework leading up to this is designed to provide breadth to prepare the students for successful careers in the academics. Besides, there are many opportunities for our students to enrich their background in mathematics. Students are strongly encouraged to talk in the research seminars in the school, and to attend national/international conferences as well as regional meetings amply supported by NISER.

**Facilities for Research and Teaching**

- State-of-the-art Computing facility and a High Performance Computing Cluster for theoretical calculation.

## School of Physical Sciences

The 5-year integrated Master of Science (M. Sc.) programme in Physics includes courses from core areas of physics such as Classical Mechanics, Quantum Mechanics, Electromagnetism, Statistical Mechanics and Mathematical Physics. In addition, elective courses based on upcoming areas in physical sciences are also offered for final and pre -final year students. Each semester of the programme includes one laboratory component where the stude nts experimentally verify their theoretical understanding of concepts. For the pre -final year students, the laboratories offer state-of-the-art experimental facilities for addressing open -ended problems in physical sciences research. Final year of the prog ramme includes one project course (depending on the expertise of the available faculty in the school) where the students learn about the various research methodologies and many aspects associated with carrying out active research in physics.
The Ph. D. students undergo one year of course work (spread over two semesters) which includes courses from the core-areas of physics such as Classical Mechanics, Quantum Mechanics, Electromagnetism, Statistical Mechanics, particle physics and condensed-matter physics.

The school offers the following broad areas in physics for carrying out research work leading to degree of Ph. D.

- High-energy physics (Theoretical) – String theory, Lattice Quantum Chromodynamics
- High-energy physics (Experimental) - Experiments at Large Hadron Collider (LHC), Switzerland
- Condensed-matter physics (Theoretical) – Electronic structure of matter, Colloids, Soft-condensed matter and statistical mechanics, density functional theory etc.
- Condensed-matter physics (Experimental) – Magnetism, superconductivity, low-temperature physics, semi-conductors and nano-fabrication, spectroscopy
- Ultra-cold atoms and Bose-Einstein condensation (Experimental)
- Photonics – Nonlinear optics, Laser Physics, Nano-photonics

**Facilities for Research and Teaching**

- Scanning Electron Microscope and Lithography
- Ultrafast Time-resolved Spectroscopy for quantum life measurements of molecular dynamics and Ultracold atoms and BEC facility using atom trapping by lasers
- Facility of Magnetic nanostructures and multilayers

## School of Humanities and Social Sciences

Scientific temper can sustain and advance in a holistic environment. Creative thinking along with skill based expertise is essential for new age scientists. The School of Humanities and Social Sciences plays a crucial role in the NISER undergraduate programme. The purpose of Humanities and Social Sciences is to help students to identify a set of values which will help them exercise integrity, vision, community involvement, and knowledge of self. It also helps students equip themselves with strong communication skills, interpersonal and team building skills and apply the same in their respective profession. Students must understand the application of their discipline to contemporary issues, they must acquire strong communicat ion and team-building skills, and they must understand the definitions of leadership, personal responsibility, and professionalism. The Humanities and Social Sciences curriculum provides students the opportunity to explore and master communication skills, critical thinking skills, innovative problem-solving skills, and other learning opportunities offered by the department. The school focuses on bridging the gap between society-science interfaces. The School of Humanities and Social Sciences (SHSS) is encompassing five specific areas of study. The school aims to become an innovative centre for research in the fields of English, Economics, Sociology, Philosophy and Psychology. With faculty drawn from diverse background and experience, it targets to be a thriving academic community, ensuring a fertile ground for true multi-disciplinary research, where academic programs are nationally recognized for high levels of quality and clear multi – disciplinary research.

The curricula of the school for the 5-year Integrated Program emphasize interdisciplinary and holistic approach to impart training and skills in humanities and social sciences. To achieve this objective, a set of core has been identified which constitutes the courses of the first two semesters, and one in each in third and forth semester. The curriculum generally begins with a two-course in communication skills, the purpose of which is to develop the required proficiency necessary to communicate, both orally and in writing, in their classes, in the workpl ace, and in community. Subsequent courses consist of introductory courses humanities and social science courses in sociology, psychology and economics that introduce students to the concepts of community, society, and self. In the third and fourth semester students are offered a variety of humanities and social science with an opportunity to select any two courses. Students are required to complete a minimum 16 credits. The electives are designed to provide advanced and applied knowledge in the areas of science communication, science, technology and society, organizational behaviour, urban planning, applied behavioural sciences, Indian society and social problems. This installs holistic vision and importance of responsible and sensitive global citizenship, through cultural self-reflection, ethical reasoning and historical understanding among the students.

The Ph. D programme aims to cultivate high quality research in various fields of English, Economics, Philosophy, Psychology and Sociology. Graduates of t he programme are expected to design and execute original, high quality, interdisciplinary research that can be published in major scholarly journals and books of the profession. The Ph. D. degree is generally a four-year program culminating in an original piece of humanities and social science research for a thesis and eventual publications in good and scholarly journals. The programme consists of both course Work and research work independently carried out by the student. While the thesis is in a specific area, the coursework leading up to this is designed to provide breadth to prepare the students for successful careers in the academics and industry. Students are expected to participate in the research seminars in the school, and to attend national/internat ional conferences as well as regional meetings amply supported by NISER. Tata Institute of Social Sciences, Mumbai has conveyed approval to host NISER students for the Ph. D programme in Humanities and Social Sciences. The institute has started the Ph. D program in Humanities and Social Sciences from the even semester of academic year 2015 -16.

## NISER LIBRARY

**The Library is an arena of Possibility, opening both a window in the soul and a door on to the world.**

***- Rita Dove***

The Central Library acts as the main learning resource centre of the institute and is privileged to support the Institution's march towards its vision - to be the pioneer research Institute in India. The Library not only acquires, organizes, and disseminates knowledge; it has put its foot ah ead towards policies, procedures, systems and services and created an atmosphere which offers assimilation and generation of new knowledge.

All the students, faculty members and employees of the Institute are entitled to make use of the Library Facilities. The library building has a carpet area of 60,000 Sq. Meters and occupied a central location. It has a rich reference section of Physics, Chemistry, Mathematics, Biology and Literature studies.

Library presently holds over 21000 print books, rich collect ion of electronic books (Approx. 10, 0000) subscribed ebooks from Springer and Elsevier and Open Access ebooks from NCBI, Intech Open, online book page and Project Gutenberg), 59 scholarly print journals and magazines, nine electronic databases, six hundred bound volume journals and approx. 3904 e-Journals (with archive for ejournals subscribed from IOP, AIP, Nature, Springer and Wiley. Electronic Journals are subscribed from all STM Publishers and Learned Societies I.e. AAAS, Elsevier, Royal Society of Chemistry, American Chemical Association, American Mathematical Association, Canadian Mathematical Association , Wolters Kluwer , BMJ, Rockefeller University Press, Portland Press, National Academy of Science US, CSHL, Oxford University Press, Thieme, T&F, O ptical Society of America , International Press, European Mathematical Society , Ramanujan Math Society, Duke University Press , University of Chicago Press etc. Library has Print archive for Ars Combinatoria Journal (1976-2017).

As part of DAE-Elsevier Consortium, NISER library has subscription to nine CORE journals with Approx. 2200 peer reviewed journals with Archival Access since 1997 onwards that adds fuel to our learning and research in several schools and Interdisciplinary studies as well.

NISER Library is having Institutional membership of American Mathematical Society (2011 onwards) and Category –A Membership of Canadian Mathematical Society (2013 onwards) and gets benefits on subscription to society publications and online Databases (Depending on the Membership Category).

**Library Collection comprises the following:**

| Sl No. | Type of Resource | Approx.Volume |
|---|---|---|
| 1 | Books and Gratis Books | 21000 |
| 2 | E-books | 10,000 |
| 3 | Print journals and Scholarly Magazines | 58 |
| 4 | Bound Volume Journals | 600 |
| 5 | Electronic Journal | 3850 |
| 6 | CD/DVD | 212 |
| 7 | Thesis submitted by Students as partial fulfillment of Int. MSc/PhD at NISER | 143 |
| 8 | Gift Journals/ Magazines | 76 |

Major contributors to Gift Journals are Indian Academy of Science, American Physical Society, Centre for Air Power Studies, Mathematical Association of America.

| | Name of the Database | Publisher |
|---|---|---|
| **Bibliographical Databases:** | 1. Scifinder Web Enabled Version | CAS Division, American Chemical Society |
| | 2. Mathscinet | American Mathematical Association |
| | 3. Web of Science cor e Collection(Back file since 1945) | Clarivate Analytics |
| | 4. CCDC-CSD Enterprise License | Cambridge Crystallographic Data Centre |
| | 5. Science Of Synthesis | Thieme |
| **Literature Updating Service** | **Name of the Database** | **Publisher** |
| | 1. Natural Product Updates | Springer Nature |
| | 2. Synthetic Reaction Updates | Royal Society of Chemistry |
| **Digital Library** | **Name of the Product** | **Publisher** |
| | JSTOR | ITHAKA |

**Library Services**:

The Library homepage serves as an integrated interface of all services avail from the Library. The interface is available at (www.niser.ac.in/Library/ ) inside NISER Website and is based on drupal open source content management system. Apart from procuring, processing and distributing books, periodicals, and other documents, library offers the following innovative services:

1. Current awareness service - New arrival display and alert (Both physical and online)

2. Alert Service to patrons such as: new arrival, overdue notice, collect notice, different email alerts regarding services.

3. Self- Services (Check-In) of issued books through book dropper installed inside Library

4. Web based Public Access Catalogue (Web OPAC) to search and retrieve records from the online catalogue of Library resources, auto r enewal of issued Books, to check fine status of users and to put hold on issued books.

5. Article on request from all STM publishers and other premier research institutions for students and faculties to fuel their research activities.

6. User awareness programme on various subscribed resources.

7. Procurement of books for departmental libraries and processing of invoices for payment from budget approved for the same by concerned Dept. and Director.

8. Technical processing of books purchased by faculties from contingency grant annually.

9. Institutional repository powered by DSpace that reflects the institutional research outputs of students and faculties.

10. Anti-plagiarism software iThenticate subscribed by the Library for students and faculties to check for plagiarism to ensure originality of work before publication.

11. Display of Publisher's Catalogue for assisting Faculties for recommending Books for Library.

12. Three Library professional trainee and three library apprentices are recruited to strengthen library manpower. Their assignment includes: to handle library housekeeping operation, to manage contingency books stock entry and technical processing, plagiarism checking of scholarly content on iThenticate, stock entry of PhD Thesis submi tted to library, Library membership registration and renewal /Cancellation, to handle user queries on fine and assistance to readers on request.

**Library Facilities:**

1. **RFID based book circulation system**: Library is fully automated with KOHA and also inte grated with RFID devices which control the circulation system for Issue, return, searching of books and weeding out miss shelved books during Annual stock verification.

2. **Wi-Fi Access**: Library is functional with Wi-Fi service in order to enable internet accessibility for the easy access of e-resources avail at the Institute Library.

3. **Air conditioned reference and reading areas** for the comfort of readers and researchers in long reading hours.

4. **Remote Access facility to electronic resources subscri bed by Library through Cloud Based RemoteXs Software.**
http://elibraryniser.remotexs.in/user/login

5. **Conference Room**: Library is also having Air Conditioned Conference Room that is used for library committee meetings, meeting with journal publishers, Service providers to library and discussion. Library also permits other schools and sections of the Institute to use conference room with advance notice to library.
6. **Cashless payment of Overdue on issued books from Library**: Library users are facilitated with cashless payment of overdue and other charges through POS during semester registration.

7. **Reading Facility to Students, researchers and Delegates visiting library for Seminar, Conference, workshop etc.** Library allows visitors to use reading space and print resources inside library. Also library facilitates promotion of library services and resources through Institutional visit from Universities to Library.

Recently, the students from PG Dept. of Library and Information Science of Khallikote University visited NISER Library with HOD Dr. Jyotshna Sahoo to get Hands on experience on library automation softwares and Services offered by our Institute Library.

**Library Timing:** Library remains open from 9:00 am to 9:00 pm. throughout the year and 9:00 am-5:30 pm. on Institute Holidays.

**Library Committee:**

Institute Library committee constitutes one member from each School, and a staff member from library. The Committee meetings are conducted bi - monthly and as and when required to discuss about the development of Library activities, procurement of books, journals, databases and queries received from users etc. Other subcommittees for the library are constituted for Annual Stock Verification of Libr ary Resources and infrastructure Development of Library to facilitate more reading space and sophisticated learning environment.

**Initiatives taken by Library to improve usage of Subscribed resources:**

**1. Upgradation of Koha current version for smooth funct ioning and more compatibility in library services**:

KOHA is upgraded to 17.11.11.000 that has been released on November 27th, 2017 that comes with many new features. It includes 9 new features, 138 Enhancements and 350 bug fixes.

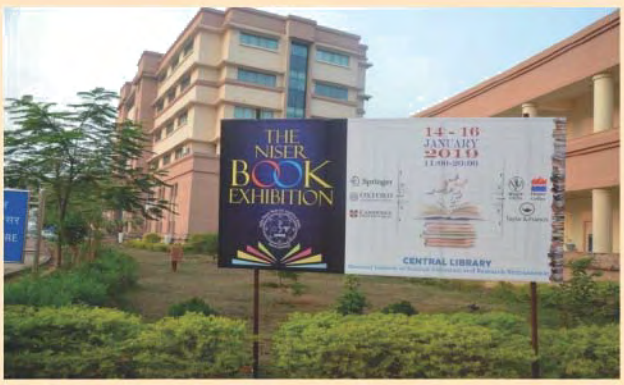
- Inter library loan module can be added to Circulation and OPAC
- Add OPAC Dashboard for Logged in users
- Holds History for Patrons
- Add automatic patron Registration via OAUth2 Login.

2. **User Awareness Program on Various Resources** :

| Sl No. | Name of the Event and Date | In Co-ordination with Publisher, Library committee & Schools | Briefing and Student - Expert's interaction on |
|---|---|---|---|
| 1 | Scifinder Training Session held on October 30th, 2018 | American Chemical Society and School of Chemical Sciences, NISER | Searching Substance Data in several Ways, retrieve Chemical Supplier Information, Import a structure and narrow the result set up , retrieve references for selected substances etc. |
| 2 | Web of Science Training Session held on February 08, 2019 | Clarivate Analytics | Briefing on WOS Core collection, How to Import references to Endnote, Journal selection process in WOS, Quartile Scores and Journal Citation Ranking etc. |

3. **Book Exhibition organized by NISER Library**

NISER Library successfully organized Book Exhibition on 14th -16th January 2019 to facilitate easy access and procurement of the latest publications for Both the Institute and Individuals with immense support from its Eleven Empanelled Book suppliers, few renowned publishers, STM Publishers, Institute Library committee, all schools of the Institute, user community as a whole. Exhibition was sponsored by few renowned publishers and book suppliers.




**Author Workshop from Oxford University Press during Exhibition:**

Author workshop was arranged from OUP and several stu dents participated and interacted with expert.


Library committee and Library team is dedicated to provide best possible services to improve learning, enhance research activities of NISER ahead.

## FIRST NISER ALUMNI MEET, 2019

In July 2018, Dr. Palok Aich, formerly Dean, IARP along with Prof. Sudhakar Panda, Director, NISER formally decided to organize the first 'NISER Alumni Meet' on January 5th, 2019. On September 11, 2018 Dr. Palok Aich formed an organizing committee and Dr. Arindam Ghosh from School of Chemical Sciences was chosen to be the convener of the meet.

The organizing committee contacted in the following months as many alumni of NISER as possible, both from the Int. MSc and the PhD programs and sent invitations for the meet. As many as 50 alumni showed interest to attend the meet but finally about 25 could make it to the program. Outstation alumni who attended the meet were:

| Name | Position | Affiliation | Year | Degree | Department |
|---|---|---|---|---|---|
| Vikram Singh Meena | Asst. Professor | Delhi University | 2012 | 5Y Int. M.Sc. | SBS |
| Puspendu Sardar | PostDoc | Biology Center, CAS | 2012 | 5Y Int. M.Sc. | SBS |
| Ved Prakash | Job | Univ. of Texas, Dallas | 2012 | 5Y Int. M.Sc. | SCS |
| Sushant Kumar Singh | Job | VECC, Kolkata | 2013 | 5Y Int. M.Sc. | SPS |
| Muna Naik | Ph. D | ISI, Kolkata | 2013 | 5Y Int. M.Sc. | SMS |
| Md. Nasim | Asst. Professor | IISER Berhampur | 2014 | Ph.D | SPS |
| Satrajit Mandal | Ph.D | IIT Kharagpur | 2015 | 5Y Int. M.Sc. | SMS |
| Dheer Noal Sunil Desai | Ph.D | Univ. of Delaware | 2017 | 5Y Int. M.Sc. | SMS |
| Rajula Srivastava | PhD | Univ. of Wisconsin-Madison | 2017 | 5Y Int. M.Sc. | SMS |
| Chandan Raj Swar | M.Tech | IIT Kharagpur | 2017 | 5Y Int. M.Sc. | SMS |
| Hardik Routray | Ph.D | Rutgers Univ., New Brunswick | 2017 | 5Y Int. M.Sc. | SPS |
| Amit Nanda | Ph.D | Stefan Meyer Institute, Vienna | 2017 | 5Y Int. M.Sc. | SPS |
| Kiran Rajhans | Asst. Director | Indie Film Collective | 2017 | 5Y Int. M.Sc. | SPS |
| G Priyanga | Ph.D | Texas A & M University | 2017 | 5Y Int. M.Sc. | SMS |
| Lopamudra Das | Asst. Professor | Dept. of Higher Edn, Odisha | 2017 | Ph.D | SBS |
| Lasien D Rymbai | Ph.D | Baylor University | 2017 | 5Y Int. M.Sc. | SCS |

The Alumni meet on 5th January 2019 was a one-day event including a half-day mini symposium where one alumnus from each school (SBS, SCS, SMS, SPS) presented their current research work. Prof. V. Chandrasekhar, formerly Director of NISER delivered a popular lecture on the history of periodic table as 2019 has been declared as the international year of the period ic table. Prof. T. K. Chandrashekar, the founding Director of NISER and Prof. J. Maharana, IOP, Bhubaneswar shared their experience and memory of building NISER.

The final year students of Integrated M.Sc. and Ph. D. Programme were also invited in the program. This inaugural alumni meet was concluded with a light musical program followed by a dinner in the community hall of NISER. It was also decided that a formal alumni cell would soon be constituted comprising faculty members, staffs and alumni of NISE R. The cell will not only maintain regular contact with the expanding alumni base but also organize future alumni meets. Few glimpses of the event are shown below:




ALUMNI MEET

## HEALTH CENTRE

Health centre in NISER, Bhubaneswar has been established to provide health care facility to the Institute members and their dependent entitled family members, students, research fellows. It aims at providing comprehensive primary health care. Apart from basic health care it also provides health promotional activities like health education, periodical health check-up and dietary advices.

Initially Health Centre was started in a residential quarter and moved to its permanent building in 16th April, 2018. The health centre at present is staffed by 3 doctors, two staff nurses and one pharmacist and one part-time paediatrician. It has facilities for OPD treatment, Laboratory Investigation, Minor surgical procedures and dressing. It has one well equipped emergency ward to provide emergency medical facility. Two basi c life support ambulances are also available to shift patient during emergency to higher centre for further medical facility. Health Centre also conduct pre-employment health examination of employees prior to joining at NISER and periodical examination of employees.

From 1st January 2019 DAE Contributory Health Service Scheme was implemented at NISER. Under the scheme different government and private hospitals are empanelled for providing treatment to referred patients on cashless basis.

**Staff:**

Dr. Biswajit Mishra, SO-D
Dr. Bandita Dash, SO-D
Dr. Rashmi Ranjan Guru, SO-C
N Bharati Reddy, Nurse-A
Sibani Bhuyan, Nurse-A
Adhikari Suryakanta Dash, Pharmacist-B

**Facilities**:

OPD consultation
Laboratory Investigations
Minor OT and Dressing room
Emergency War d

**Statistics:**

| | |
|---|---|
| No OPD patients | 4054 |
| No Laboratory Investigations | 2055 |
| No of Pre-employment examination | 66 |

# FACULTY

## School of Biological Sciences

| Sl. No. | Name & Designation | Field of Specialization |
|---|---|---|
| 1. | Prof. B. Ravindran<br>Adjunct Professor | Microbiology |
| 2. | Dr. Abdur Rahaman<br>Reader-F | Biochemistry |
| 3. | Dr. Asima Bhattacharyya<br>Associate Professor | Physiology / Host-Pathogen Interaction, Cancer Biology |
| 4. | Dr. Chandan Goswami (Chairperson)<br>Associate Professor | Cell Biology |
| 5. | Dr. Harapriya Mohapatra<br>Associate Professor | Microbiology |
| 6. | Dr. Kishore CS Panigrahi<br>Reader-F | Plant Biology |
| 7. | Dr. Debasmita Pankaj Alone<br>Reader -F | Human Genetics |
| 8. | Dr. Manjusha Dixit<br>Reader -F | Human Genetics |
| 9. | Dr. Palok Aich<br>Associate Professor | Systems Biology |
| 10. | Dr. Pankaj Vidyadhar Alone<br>Reader-F | Molecular Biology |
| 11. | Dr. Praful Singru<br>Associate Professor | Neurobiology |
| 12 | Dr. Subhasis Chattopadhyay<br>Reader-F | Immunology |
| 13. | Dr. V Badireenath Konkimalla<br>Reader-F | Bioinformatics |
| 14. | Dr. Rudresh Acharya<br>Reader-F | Macromolecular X-ray Crystallography, Structural Bilogy, De Novo Protein Design |
| 15. | Dr. Tirumala Kumar Chowdary<br>Reader-F | Structural Virology |
| 16. | Dr. Ramanujam Srinivasan<br>Reader-F | Bacterial Pathogenesis, Cytoskeletal Dynamics and Functions |
| 17. | Dr. Renjith Mathew<br>Reader-F | Cell Biology, Development Biology |
| 18. | Dr. Aniruddha Datta Roy<br>Assistant Professor | Phylogenetics, Biogeography |

## School of Chemical Sciences

| Sl. No. | Name & Designation | Field of Specialization |
|---|---|---|
| 1. | Prof. V. Chandrasekhar<br>Adjunct Professor | Organometallic Chemistry, Inorganic-Cored Star Bursts, Multinuclear Transition Metal Assemblies, Inorganic Rings and Polymers, Single Molecule Magnets |
| 2. | Prof. T.K. Chandrashekar<br>Sr. Professor | Inorganic Chemistry<br>Bio-Inorganic Chemistry-Expanded porphyrin Chemistry |
| 3. | Prof. A. Srinivasan (Chairperson)<br>Professor | Inorganic Chemistry<br>Bio-Inorganic Chemistry-Pyrrole Based Receptors |
| 4. | Dr. Arindam Ghosh<br>Reader-F | Physical Chemistry<br>Methodology development in NMR |
| 5. | Dr. B.L. Bhargava<br>Reader -F | Physical Chemistry<br>Computational studies of Materials |
| 6. | Dr. C.S. Purohit<br>Reader -F | Organic Chemistry<br>Bio-organic and Organic Synthesis |
| 7. | Dr. C. Gunanathan<br>Associate Professor | Organic Chemistry<br>Organomettallic Chemistry and Catalysis |
| 8. | Dr. J.N. Behera<br>Associate Professor | Inorganic Chemistry<br>Law temperature multiferroics from single source precursors and Porous Magnetic Materials |
| 9. | Dr. M. Sarkar<br>Associate Professor | Physical Chemistry<br>Fluorescence Spectroscopy |
| 10. | Dr. N.K. Sharma<br>Reader-F | Inorganic Chemistry<br>Bio-Organic and Organic Synthesis |
| 11. | Dr. Prasenjit Mal<br>Associate Professor | Inorganic Chemistry<br>Supramolecular chemistry and Photochemistry |
| 12 | Dr. S. Peruncheralathan<br>Reader -F | Organic Chemistry<br>Synthetic Organic chemistry and Asymmetric Catalysis |
| 13. | Dr. Sanjib Kar<br>Associate Professor | Inorganic Chemistry<br>Bio-inorganic chemistry: Metals in Medicine |

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| 14. | Dr. Sharanappa Nembenna<br>Associate Professor | Inorganic Chemistry<br>Main Group Organometallic chemistry and Low oxidation state metal chemistry |
| 15. | Dr. Subhadeep Ghosh<br>Associate Professor | Physical Chemistry<br>Single Molecule Spectroscopy, Molecular Dynamics |
| 16. | Dr. Sudip Barman<br>Associate Professor | Physical Chemistry<br>Synthesis and Functionalization of Graphene |
| 17. | Dr. U. Lourderaj<br>Associate Professor | Physical Chemistry<br>Theoretical and Computational Chemistry |
| 18. | Dr. V. Krishnan<br>Associate Professor | Inorganic Chemistry<br>Catalysis and Materials Synthesis |
| 19. | Dr. Himansu Sekhar Biswal<br>Associate Professor | Laser Spectroscopy and Instrumentation |
| 20. | Dr. P.C. Ravikumar<br>Reader-F | Inorganic Chemistry |
| 21. | Dr. Bidraha Bagh<br>Assistant Professor | Inorganic and Organometallic Chemistry |

**School of Mathematical Sciences**

| Sl. No. | Name & Designation | Field of Specialization |
|---|---|---|
| 1. | Prof. Madumbai Seshachalu Narasimhan<br>Honorary Fellow | Moduli of Vector Bundles, Partial Differential Equations, Mathematical Physics, Representation Theory |
| 2. | Prof. V. Muruganandam<br>Professor | Harmonic Analysis |
| 3. | Dr. Anil Kumar Karn<br>Associate Professor | Theory of operator spaces |
| 4. | Dr. Biond Kumar Sahoo<br>Associate Professor | Representations of Geometries |
| 5. | Dr. Brundaban Sahu<br>Associate Professor | Number Theory |
| 6. | Dr. Deepak Kumar Dalai<br>Reader-F | Cryptography |
| 7. | Dr. Kamal Lochan Patra<br>(Chairperson)<br>Reader-F | Algebraic Graph Theory |
| 8. | Dr. Nabin Kumar Jana<br>Assistant Professor | Probability Theory |
| 9. | Dr. Sanjay Parui<br>Reader-F | Harmonic Analysis |

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| 10. | Dr. Shyamal Krisha De<br>Reader - F | Topology |
| 11. | Dr. Manas Ranjan Sahoo<br>Reader - F | Differential Equations |
| 12 | Dr. Jaban Meher<br>Reader - F | Number Theory |
| 13. | Dr. Ritwik Mukherjee<br>Reader - F | Differential Geometry |
| 14. | Dr. Sutanu Roy<br>Assistant Professor | Functional Analysis |
| 15. | Dr. Panchugopal Bikram<br>Assistant Professor | Functional Analysis |
| 16. | Dr. Dinesh Kumar Keshari<br>Assistant Professor | Functional Analysis |
| 17. | Dr. K. Senthil Kumar<br>Assistant Professor | Number Theory |

**School of Physical Sciences**

| Sl. No. | Name & Designation | Field of Specialization |
|---|---|---|
| 1. | Prof. Ashoke Sen<br>Honorary Fellow | String Theory |
| 2. | Prof. Jnanadeva Maharana<br>Adjunct Professor | String Theory |
| 3. | Prof. Subhendra D. Mahanti<br>Adjunct Professor | Theoretical Condensed Matter Physics |
| 4. | Prof. Meenakshi Narain<br>Adjunct Professor | Experimental High Energy Physics |
| 5. | Prof. Nu Xu<br>Adjunct Professor | Experimental High Energy Physics |
| 6. | Prof. Sourendu Gupta<br>Adjunct Professor | Theoretical High Energy Physics |
| 7. | Prof. Tapan K. Nayak<br>Visiting Professor | Experimental High Energy Physics |
| 8. | Prof. Sudhakar Panda (Director)<br>Sr. Professor | String Theory |
| 9. | Prof. Bedangadas Mohanty<br>Professor | Experimental High Energy Physics |
| 10. | Dr. Subhasis Basak<br>Reader-F | HEP Theory: Lattice QCD |
| 11. | Dr. Sanjay Kumar Swain<br>Associate Professor | Experimental HEP: LHP Physics |

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| 12 | Dr. A.V. Anil Kumar<br>Reader-F | Statistical Mechanics and Modeling of Soft Matter |
| 13. | Dr. Ashok Mohapatra (Chairperson)<br>Reader-F | Ultra cold Atoms and Bose-Einstein Condensation |
| 14. | Dr. Chethan N. Gowdigere<br>Reader-F | String Theory |
| 15. | Dr. Colin Benjamin<br>Reader -F | Theoretical CMP and Quantum Information |
| 16. | Dr. Joydeep Bhattacharjee<br>Reader-F | Computational Condensed Matter Physics |
| 17. | Dr. Kartikeswar Senapati<br>Reader-F | Experimental CMP |
| 18. | Dr. Prasanjit Samal<br>Reader-F | Theoretical CMP, Atomic and Molecular Physics |
| 19. | Dr. Pratap Kumar Sahoo<br>Reader-F | Nano fabrication and Ion/Photon matter interaction |
| 20. | Dr. Prolay Kumar Mal<br>Reader-F | Experimental High Energy Physics (Collider experiments) |
| 21. | Dr. Ritwick Das<br>Reader-F | Nonlinear optics, and Integrated Optics |
| 22. | Subhankar Bedanta<br>Associate Profesor | Experimental condensed matter physics (Nanomagnetism and multiferroics) |
| 23. | Dr. Sumedha<br>Reader-F | Special Mechanics and Interdisciplinary Applications |
| 24. | Dr. Yogesh Kumar Srivastava<br>Reader-F | String Theory |
| 25. | Dr. V. Ravi Chandra<br>Reader-F | Theoretical Condensed Matter Physics |
| 26. | Dr. Prolay Kumar Mal<br>Reader-F | Experimental High Energy Physics |
| 27. | Dr. Nishikant Khandai<br>Reader-F | Astrophysics and Cosmology |
| 28. | Dr. Anamitra Mukherjee<br>Reader-F | Condensed Matter Physics |
| 29. | Dr. Victor Roy<br>Assistant Professor | Theoretical & phenomenological study of high energy nuclear collisions, specifically the study of Quark Gluon Plasma (QGP). |
| 30. | Dr. Ajaya Kumar Nayak<br>Assistant Professor | Condensed Matter Experiment: Magnetism |
| 31. | Dr. Amaresh Kumar Jaiswal<br>Assistant Professor | Theoretical high energy nuclear physics |
| 32. | Dr. Sayantani Bhattacharyya<br>Reader 'F' | String Theory |

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| 33. | Dr. Tuhin Ghosh<br>Assistant Professor | Cosmic Microwave Background Radiation, Dust Polarization, Primordial gravitational waves from cosmic inflation |
| 34. | Dr. Najmul Haque<br>Assistant Professor | High Energy Physics (Theory) |
| 35. | Dr. Ashis Kumar Nandy<br>Assistant Professor | Condensed Matter Physics (Theory) |
| 36. | Dr. Kush Saha<br>Assistant Professor | Theoretical Condensed Matter Physics |

## School of Humanities and Social Sciences

| Sl. No. | Name & Designation | Field of Specialization |
|---|---|---|
| 1. | Dr. Pranay K. Swain (Chairperson)<br>Reader-F | Public Policy and Governance, Science-Society Interface, Contemporary Social Issues |
| 2. | Dr. Debashis Pattanaik<br>Assistant Professor | Social Innovation, Social Network Analysis, Social Study of Sciences and Technology |
| 3. | Dr. Rooplekha Khuntia<br>Assistant Professor | Business Ethics, Ethical Cynicism, Organizational Behavior and Leadership |
| 4. | Dr. Joe Varghese Yeldho<br>Reader - F | Critical History and Narratives of Race |
| 5. | Dr. Amarendra Das<br>Reader - F | Natural Resource Management, Public Economics |
| 6. | Dr. Amarjeet Nayak<br>Reader - F | Postcolonial Theory and Literature, Translation Studies, Speculative Fiction, Indian English Literature, Diaspora Studies |

## School of Earth and Planetary Sciences

| Sl. No. | Name and Designation | Field of Specialisation |
|---|---|---|
| 1. | Dr. Guneshwar Singh Thangjam<br>Assistant Professor | Planetary Geology |

## School of Computer Sciences

| Sl. No. | Name and Designation | Field of Specialisation |
|---|---|---|
| 1. | Prof. Manindra Agrawal<br>Adjunct Professor | Computational complexity theory, Computational number theory & Algebra. |
| 2. | Dr. Rishiraj Bhattacharyya<br>Reader – F (Chairperson) | Cryptography |
| 3. | Dr. Subhankar Mishra<br>Assistant Professor | Graph Theory, Cyber Security, Smart Grid |

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| 4. | Dr. Aritra Banik<br>Assistant Professor | Computational Geometry |
| 5. | Dr. Manoj Mishra<br>Assistant Professor | Information Theory, Cryptography |
| 6. | Sabyasachi Karati<br>Assistant Professor | Cryptography |
| 7. | Dr. Sushmita Gupta<br>Assistant Professor | Algorithms |

## COURSES OFFERED

### School of Biological Sciences

Endocrinology, Plant Development Biology, Quantitative Biology, Biological Techniques: Theory and Practices, Biology-I : Science of Live, Biology-II: Celluar and Genetic basis of life, Biophysics and Biostat, Cell Biology, Genetics, Ecology, Molecular Biology, Advance Molecular Biology, Advanced Biochemistry, Microbiology, Biochemistry, Physiology I (Animal Physiology), Physiology – II (Plant Physiology), Neurobiology, Principles of Drug design, Molecular genetics, Infection and immunity, Immunology, Enzymology, Virology, Structural Biology, Mol Biology Laboratory, Immunology Laboratory, Animal Physiology Lab, Plant Physiology Lab, Cell Biology Laboratory, Genetics Laboratory.

### School of Chemical Sciences

Theory: Chemistry I, Quantum Chemistry I, Physical Methods in Chemistry II, Nuclear Magnetic Resonance, Basic Inorganic Chemistry, Polymer Chemistry, Advanced Organic Chemistry, Classics in Molecules, Physical Organic Chemistry, Organic Chemistry I, Organic Chemistry II, Organic Chemistry III, Supramolecular Chemistry, Organic Photochemistry, Advanced Bio-Organic Chemistry, Magnetism, Solid State Chemistry, Crystallography. Laboratory: Chemistry Lab I, Chemistry Lab II, Chemistry Lab III, Physical Chemistry Lab -1, Biomolecular Lab, Electronics Lab, Inorganic Chemistry Lab.

### School of Mathematical Sciences

General Mathematics – I & II, Computation Laboratory – I & II, Analysis-I, II & III, Algebra-I (Group Theory), Discrete Mathematics, Algebra-II (Linear Algebra), Probability Theory, Elementary Number Theory, Algebra-III (Rings and Modules), Differential Equatio ns, Topology, Analysis -IV (Calculus of Several Variables), Algebra -IV (Field Theory), Complex Analysis, Optimization Theory, Differential Geometry, Functional Analysis, Representation of Finite Groups, Measure Theory, Advanced PDE, Advanced Probability and Stochastic Process, Nonlinear Analysis, Commutative Algebra, Advanced Linear Algebra, Information & Coding Theory, Algebraic Topology, Operator Algebra, Harmonic Analysis.

### School of Physical Sciences

Core: Mechanics and Thermodynamics, Electricity, Magnetism and Optics, Classical Mechanics, Mathematical Methods I, Electronics, Electromagnetism I, Mathematical Methods II, Quantum Mechanics I, Electromagnetism II, Statistical Mechanics, Quantum Mechanics II, Special relativity, Atoms, Molecules and Radiation, Introduction to Condensed Matter Physics, Nuclei and Particles Electives: Classical Mechanics-II, Advanced Solid State Physics, Astronomy and Astrophysics, Computational Physics, Quantum Field Theory I, Quantum Optics, Particle Physics, Introduction to Phase-transition and Critical Phenomena, Plasma Physics and Magneto-hydrodynamics, Biophysics, Nonlinear optics and laser, Quantum Information, General Relativity and Cosmology, Soft Condensed matter, Applied Nuclear Physics, Many Body Physics, Quantum and Nano-Electronics, Nonlinear Physics, Chaos, Turbulence, Theory of Magnetism and Superconductivity, Density functional theory of atoms molecules and solids, Quantum Field Theory II.

### School of Humanities and Social Sciences

Technical communication – I & II, Introduction to Psychology, Introduction to Sociology, Introduction to Economics, History of Science, Sociology of Science and Technology, Science Communication and Citizen, Organizational Behaviour, Applied Behavioural Science, Perspectives on Indian Society, Life and Community in the Urban World.

## ACADEMIC ACHIEVEMENTS AND RESEARCH OVERVIEW

### SCHOOL OF BIOLOGICAL SCIENCES

**Phylogenetics, Systematics, Biogeography**
**Dr. Aniruddha Datta Roy, Assistant Professor**

The contemporary distribution of biota within the Indian subcontinent must have been shaped by its unique history. The Indian subcontinent was part of Gondwanaland and had close tectonic associations with Africa, Madagascar and Seychelles before eventually colliding with Eurasia, resulting in the orogenesis of the Himalayas. The initial contact of the Indian plate with Southeast Asia may have potentially resulted in exchange of biota across these two landmasses. On the other hand, the contemporary Indian sub region remains insular from other biogeograp hic zones areas owing to various geographic barriers. Prolonged insularity generally promotes diversification in lineages with limited dispersal ability, resulting in endemic radiations. Beyond bearing these unique spatial and temporal signatures in its bi otic assembly, the Indian subcontinent itself is heterogeneous in its topography with about ten major river systems/ basins flowing out of the peninsula. Additionally, the Indian subcontinent has about six major hill ranges. Cumulatively, these factors wou ld have had (or still have) a significant effect on the contemporary distribution of biota within the Indian subcontinent, resulting in an interesting mix of lineages. Indian biota may therefore be composed of ancient Gondwanan relicts to lineages that dispersed more recently from other regions. I am personally interested in South Asian herpetofauna (reptiles and amphibians), largely owing to their diversity and antiquity. However, in my lab we have a set of broad interests ranging from understanding system atics, biogeographic patterns and evolution of characters in a diverse range of taxa from the Indian

subcontinent. As a lab PI, I want to maintain and inculcate a keen interest in organismal biology, ecology, natural history, systematics and biogeography.

**Gastric Cancer: Disease Progression and Metastasis**
**Dr. Asima Bhattacharyya, Associate Professor**

Gastric cancer is a major cause of mortality. Although various causative agents have been associated with this disease, Helicobacter pylori, a microaerophili c, gram-negative bacterium has been identified as one of the main carcinogens causing gastric cancer and contributing in gastric cancer metastasis. Like many epithelial-origin solid tumours, dissemination or gastric cancer (gastric cancer metastasis) is mediated by epithelial to mesenchymal transition (EMT), a mechanism that converts immotile epithelial cells into motile and invasive mesenchymal cells. Hypoxia is known to aggravate the EMT and metastatic properties. The molecular events in H. pylori and hypoxia-driven gastric cancer progression and metastasis are complex and multi-factorial. We are involved in identifying the molecular events and pathways that contribute in gastric cancer progression and metastasis. Our approach includes in vitro and in vivo studies as well as studies involving 3D organoids.

**Drug Development and Delivery**
**Dr. KVS Badireenath, Reader – F**

Natural products have been a rich resource of medicines for treating different diseases since time immemorial. Through developments in modern science and technology, research was able to isolate the active ingredients that are responsible for biological activity. While isolation helps in obtaining the compound in its purest form nevertheless, it becomes difficult to develop as a drug due to poor solubility, bioefficacy or targeting. From the previous studies in our lab we have identified sulforaphane (SFN) as immunomodulatory drug that has a potential in autoimmune conditions like Rheumatoid arthritis. We are presently investigating other isoth iocyanates (ITCs) that have similar activity. Other the other hand, we are developing different drug delivery systems like liposomes, hydrogels, etc. to enhance the efficacy of ITC.

**Cell Biology of Thermo Sensitive ion Channels**
**Dr. Chandan Goswami, Associate Professor**

Transient receptor Potential (TRP) ion channels are involved in a series of physiological functions and complex sensory events. Mutations and abnormal expressions in TRP channels often leads to pathophysiological conditions known as "channelopathy". TRP channels are special group of ion channels as these channels has thermo-gating behaviour, i.e. activation by higher or lower temperature. Our lab has focused to dissect out the importance of thermo-sensitive ion channels in different cellular functions, regulation of subcellular organization, organelle functions. For this purpose, we use different cell types ranging from neuron, osteoclasts, osteoblasts, keratinocytes, immune cells and haploid mature gametes. We analyse sequence variations and conservation of these TRP channels in order to understand the importance of critical regions relevant for channel function, regulations and channel gating.

**Cellular Immunology**
**Dr. Subhasis Chattopadhyay, Reader – F**

We have been working in the field cellular immunology towards T cell and Macrophage responses associated to cell mediated immunity (CMI), Immune regulation, Chikungunya virus (CHIKV) infection immunity. Our works aim to dissect out the fundamental roles of cellular and

immunological aspects associated to the cellular pathways, mechanism towards the altered host cell responses for an ongoing infection, inflammation and immuo-regulatory processes related to several contexts of various diseases.

Our current works highlights a role of transient receptor potential (TRP) channels, a group of thermosensitive and non-selective cation channels, in T cell responses. CHIKV infection in macrophages induces Apoptosis, MHC, B7, IL-6 and MCP-1. An interesting role of a potential HSP90 inhibitor to regulate CHIKV infection, pro inflammatory cytokine/chemokine production and apoptosis of macrophages during CHIKV infection was established. Recently we have found that there might be an essential requirement of TLR4 responses during resting T cell activation and effector function. Very recently we have demonstrated that CHIKV triggers robust TNF production in the host macrophages via both p-p38 and p-JNK/p-c-jun pathways and the interaction of viral protein, nsP2 with these MAPKs during infection.

Such understanding will be helpful towards designing future immunotherapeutic strategies to control various diseases.

**In search of a stable healthy gut microbiome: Understanding Gut-brain-gut axis by perturbation**

**Dr. Palok Aich, Associate Professor**

A large number of microorganisms, collectively known as microbiota, colonize mammalian epithelial surfaces. Majority (>99%) of this microbial ecosystem is populated by bacteria and live as mutualists in close contact with mucosal surfaces. The largest density of bacteria is observed in the gastrointestinal tract and therefore this interface is subject of most studies. Bacteria in gut is multifunctional that include a) production of essential nutrients and co-metabolization of food, b) prevention of bacterial overgrowth and infection, c) influence on central physiological functions such as development of lymphatic tissue, the induction of mucosal tolerance, angiogenesis and fat storage.

Targeted manipulation of the gut flora is increasingly being recognized as a means to improve health. Yet, the temporal dynamics and intra- and inter-individual heterogeneity of the microbiome represent experimental limitations, especially in human cross-sectional studies. Therefore, rodent models represent an invaluable tool to study the host –microbiota interface. We use models of bacterial challenge, antibiotics and diet as means of perturbation of gut microbiota in mouse model. The objective of the study is with the perspective of translation towards public health. We try to establish a consortium of gut microbiota that is stable and required to maintain health. Outcome of the research has application in translational medical product and can be effective in public health.

**Molecular pathogenesis of age-related neurodegenerative disorders**

**Dr. Debasmita Pankaj Alone, Reader – F**

With the shifting demographics towards older age, there is a major concern for age-related disorders. 90% of individuals dying each year are due to age-related causes. Understanding the genome, epigenome and proteome between healthy and diseased state of these individuals pave a way for unravelling bio-markers for early diagnosis and/or therapeutics for various diseases. Our goal is to find these underlying players that change the micro-environmental niche differently in a diseased state during the developmental process of aging and hence are responsible for these age related-disorders. We are currently focusing on understanding the pathomechanism of two neurodegenerative eye disorders (Glaucoma, the leading cause of irreversible World Blindness and Corneal Endothelial Dystrophies) as well as Cancer using a

pleothora of cellular, biochemical, genetics, genomics and molecular biology techniques involving human samples, Drosophilamodels as well as in vitrocell lines.

**Molecular Microbiology: (i) Functional significance of membrane proteins**
**(ii) Mechanisms underlying bacterial persistence.**
**Dr. Harapriya Mohapatra, Associate Professor**

An unprecedented increase in the proportion of resistance bacteria has threatened modern advances in medical science. The development of resistance in bacteria is not only due to acquisition of genes. Structures (proteins) intrinsic to cellular functions and survival play a significant role in the organism tiding over the unfavourable situation. Our research focuses on developing understanding of two such aspects involving the bacterial membrane protein and persistence mechanism. We are trying to address how membrane proteins help the organism deal with the external milieu including interaction with the host cells? In the s econd part of our research, we are trying to understand how isogenic population of cells respond differentially to a stress condition? We investigate these aspects in Enterobacter and Klebsiella that are opportunistic pathogens. Various microbial, molecular biology, biochemical and cell culture techniques are utilized for addressing these questions.

**Plant physiology and development**
**Dr. Kishore CS Panigrahi, Reader – F**

Light signaling and flowering time control in plants
Light as a signal plays a pivotal role in every step of plant development. Recently It has also been shown that Light and temperature is sensed by the same photoreceptor, Phytochrome B in plants. We have focused on the interaction of light and auxin signaling pathways and their possible cross talks, using a model flowering plant Arabidopsis thaliana and a model non flowering plant, moss, Physcomitrealla Patens. Auxin plays a major role in root patterning and we evaluated the light intensity dependent root patterning as well as its gene expr ession profiling. We for the first time observed that carbon nanoparticle in the media or soil accelerate the flowering in plants and is independent of photoperiod. The photoperiodic pathway uses a master regulator called CONSTANS. A splice variant (sv) of CO has been shown to play a dominant negative role in flowering. We investigate the mechanistic control of flowering by COsv. The effect and mechanism of different sugars and carbon nanoparticles on root patterning and flowering under different light cond itions are in progress. Furthermore, we evaluate the biochemical nature of a very important clock associated protein GIGANTEA and its role in disease resistance.

**Tumour Angiogenesis Regulation and Cancer Genetics**
**Dr. Manjusha Dixit, Reader – F**

Abnormal growth of new blood vessels plays an important role in many diseases, including cancer. To treat cancer, various potential anti -angiogenesis drugs have been tested with limited success. Blocking just one regulatory pathway may not be enough. Till date, all these angiogenic-switch regulatory molecules and their mechanism are not known. In order to do that, my research group is interested towards the validation and elucidation of the molecular mechanism of putative angiogenic regulators. We are also interest ed in finding out the role and molecular mechanism of these newly identified angiogenesis regulators, in tumorigenesis and tumor angiogenesis. We started with FRG1 (a putative angiogenic regulator) and further research led to identification of EEF1A2 and IQGAP2, as its interacting partners. Currently, we have established FRG1 to have reduced expression in cancer and its effect on various properties of

cells (proliferation, migration and invasion). We found that IQGAP2 expression is also reduced but the expression of EEF1A2 is increased in tumor tissues. We discovered the mechanism of, how FRG1 and IQGAP2 behave as tumor suppressor genes but EEF1A2 behaves as an oncogene. Our data suggests that all three genes may impart tumorigenic potential by affecting a ngiogenesis. Another major area of our research includes understanding molecular mechanism of gallbladder cancer and establishment of genetic risk factors in Indian population. So far, we have found that SNPs present in MMP14 affect it's expression and mi ght be responsible for altered risk in the population of Odisha.

**Complex cell and tissue architecture**
**Renjith Mathew, Reader – F**

The complexities of structures can be explained in terms of the shapes of the units building it and the organisational principles that the unit follow in order to construct the structure. In biology, the complex structures of tissues and organs are important since the forms directly relate to the function. At the foundation of the shapes is the highly flexible basic unit, the c ell, and the myriads of shapes it can achieve. However, unlike in inanimate units, the cell has a complex network of processes inside; the sub-cellular activities, that actively control its shape. We are interested in how cells regulate their shapes, how t he cell shapes organise to generate higher order tissue and organ architectures, and the mechanisms that maintain these complexities against degenerative forces.

**Molecular mechanism of eukaryotic translation initiation**
**Dr. Pankaj V. Alone, Reader – F**

Establishment of the open reading frame (ORF) is critical for the decoding of the genetic code. The eukaryotic translation initiation factor 5 (eIF5) provides GTPase activating protein function during the selection of start codon and ORF. However, the hype G TPase eIF5G31R mutant causes preferential utilization of UUG as a start codon and term as suppressor of initiation codon ($Sui^-$) phenotype and also represses GCN4 translation under starvation condition ($Gcn^-$) phenotype. We have uncovered a novel mechanism of $Gcn^-$ phenotype in which the eIF5G31R mutation could utilized the up-steam UUG codons (upUUG1-10 ORF) from the 5 regulatory region of the GCN4 transcript and dissociate before reaching the main GCN4 ORF.
To gain insights in to the role of 18S rRNA in t he start codon selection, a suppressor screen was performed that could suppress the preferential UUG codon recognition of the eIF5G31R mutation. We isolated a suppressor mutant C1209U in the helix h32 region of the 18S rRNA (40S head domain). The C1209U mutation suppresses $Sui^-$ and $Gcn^-$ phenotype of eIF5G31R mutation. We showed that the C1209U mutation in 40S ribosomal may perturb the premature head rotation in 'Closed/PIN'state and enhance the stringency of translation start codon selection.

**Protein crystallography, and De novo protein design Structural basis for the functioning of viral ion channels, histidine kinases, and polysaccharide Lyases**

**Dr. Rudresh Acharya, Reader – F**

Proteins are workhorses of a cell, engaged in a wide range of task comprisin g structural stability, cell signalling, catalysis, transporting, molecular printing, membrane fusion, regulation, etc. Understanding the mechanism that underlies the functioning of these molecular gadgets is an intriguing question, and defines the fundamentals of biological processes. This is an interdisciplinary research program and we set out to address the question using X -ray crystallography coupled with biophysical and biochemical approaches.

**Viral ion channels**: Cation selective channels are present in several enveloped pathogenic viruses (example: Influenza viruses, Hepatitis C virus, Chikungunya). Often, the channels are essential for virus life-cycle and production of infectious viruses. Our structural biology group aim to deduce the structure-based mechanism for the functioning of the channels.

**Two component systems in bacteria**: We are interested in determining the structures of bacterial two component systems (Histidine kinase and its response regulator), a wide spread signal transducer in prokaryotes. Here, our focus is to provide structure-based mechanistic model for sensing and transmission of signal.

**Polysaccharide Lyases (PLs)**: Bacterial polysaccharide lyases catalyze the degradation of the anion polysaccharides in the host extracellular matrix and act as virulence factor. Infection ensue this process. We are exploring the structural basis for the pH dependent functioning of pathologically important polysaccharide lyases.

**De novo protein design**: Our other research program is de novo protein design, which aim to put our understanding of principles that define protein folding and functioning into test. Here, inspired by nature we seek to design self-assembling scaffolds that harbor tailored functions, and bind co-factors to create new materials

**Cell Cycle and Cytoskeleton Dynamics**
**Dr. Ramanujam Srinivasan, Reader – F**

The identification of cytoskeleton in bacteria represents a major paradigm shift in biology. The bacterial cytoskeleton provides a framework to understand the mechanical basis of spatial organization and functions, such as cell integrity, cell shape establishment, DNA segregation, and cell division. Such force requiring functions in eukaryotic cells require the coordinated action of molecular motors with the cytoskeleton. However, no molecular motors have been identified so far in bacteria. So, how do **bacterial cytoskeletal proteins generate force in the absence of molecular motors**? Our long-term goal is to address this question. We propose to focus on the two processes that underlie any living cell: partitioning of its genetic (mitosis) and cytoplasmic (cytokinesis) components.

**Mechanism and Regulation of Nuclear Expansion**
**Dr. Abdur Rahaman**

Nuclear remodeling is a universal process that occurs in all eukaryotes including human. It is relevant to human health, since a number of known human diseases are linked to nuclear remodelling. Moreover, changes in nuclear size and shape are relevant to cancer, aging and other pathobiological conditions. Therefore, identifying and understanding factors associated with nuclear remodeling will make important contribution not only to basic research but also to understanding these diseases, and could provide potential means for therapeutic intervention.

In spite of extensive research using higher eukaryotic systems, some basic questions related to nuclear remodeling remains unanswered. For example, the mechanism of coordinated biosynthesis, targeting, and interaction of the nuclear membrane with nuclear pores, with inner

nuclear membrane proteins and with chromatin is not clearly understood. Similarly, the mechanism of lipid addition to the nuclear envelope is not known.
Tetrahymenaundergoes closed mitosis and nuclear envelope expands ~10 folds during specific stages in cell conjugation. Gene manipulation, generation of knockouts, maintenance of lethal alleles and in vivo structure-function analysis are easily achieved in Tetrahymena. This makes it a suitable model organism to study nuclear remodeling.

**Neural circuits, neuropeptides and behavi or**
**Dr. Praful Singru, Associate Professor**

Hypothalamic arcuate nucleus (ARC) has emerged as crucial integrative center of the neural circuitry regulating energy balance. ARC neurons synthesize orexigenic [neuropeptide Y (NPY) and agouti-related protein] and anorexigenic [cocaine-and amphetamine-regulated transcript (CART) and alpha-melanocyte-stimulating hormone] neuropeptides and project to hypothalamic paraventricular nucleus (PVN). The axons from ARC innervate and regulate thyrotropin -releasing hormone (TRH)-synthesizing neurons in medial PVN to regulate energy expenditure. Another distinct group of TRH neurons resides in anterior PVN (PVNa) but its relevance has remained unexplored. Although TRH is fully conserved across the vertebrate phyla, believ ed to mediate neuronal communication, significance of TRH in the brain of non -mammalian vertebrates and evolutionary emergence of TRH as regulator of energy balance, are not well established.
We have been interested in understanding the significance of n on-hypophysiotropic TRHergic system in brain, role of neuromdulators/neuropeptides/ion channels regulatingTRHergic system and its regulatory pathways, and evolutionarily significance of the peptide. We have observed that while PVNa TRH neurons innervate a nd regulate feeding-related neurons in ARC in rats, TRH neurons in the preoptic area of teleost regulates dopaminergic neurons and reproduction (J. Comp. Neurol. 2019, 527; 1070-1101). Further, CART- and NPY-containing systems interact to regulate TRH neu rons (J. Comp. Neurol. 2016, 524, 3014-41).

**Structural biology of viral molecular machines**
**Dr. Tirumala Kumar Chowdary**

Viruses can be construed as complex assembly of biomolecules. As there is no chemical energy (ATP/GTP) generating mechanism in viruses, structures of protein assembly are adapted for mechanical jobs. My lab is interested in understanding structure and functional relationship of viral proteins involved in viral -cell membrane fusion, viral replication and nucleic acid packaging. Our long term goal is to explain mechanism of viral protein 'machines' in various steps of viral biological cycle.

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**Book:**

1. **Dr. Shyamasree Ghosh**, Nanomaterials Safety: Toxicity and Health Hazards; DeGryter: 2018

## Awards and Honors received

1. **Dr. Asima Bhattacharyya** has become, Life Member of Indian Society of Translational Medicine
2. **Dr. Asima Bhattacharyya** has served as editorial board member: Journals of Gastroenterology, Pancreatology & Liver Disorders
3. **Dr. Asima Bhattacharyya** has been elected as Member of Research advisory committee (RAC) for multi-disciplinary research unit (MRU) of SCB Medical College, Cuttack.
4. **Dr. KVS Badireenath** has become Editorial Board Member, Mini-Reviews in Medicinal Chemistry (Bentham Science Publishers), Current topics in Medicinal Chemistry (Bentham Science Publishers) since 2018.
5. **Dr. Chandan Goswami** has won the **EMBL Travel Awa rd** for attending "EMBO Workshop on "Endoplasmic Reticulum functions in health and disease" at Lucca, Italy, 2018
6. **Dr. Chandan Goswami** has been selected as the "**DAAD Research Ambassador for 2018 - 2022"**
7. **Dr. Subhasis Chattopadhyay** has Secured 1st position in 34th Inter DAE sports meet in East Zone (Konark group) in the DAE Zonal level Table Tennis event held in NISER, Bhubaneswar dated 9th and 10th October 2018 representing NISER.
8. **Dr. Subhasis Chattopadhyay** represented "Konark" Group (DAE East Zone) in the Table Tennis event towards 34th Annual All India DAE Sports & Cultural Meet held on 7th -11th Jan 2019 in RRCAT, Indore.
9. **Dr. Palok Aich** has been awarded with the Badge of Honor, Public Health, Sofia Medical Academy, Sofia, Bulgaria, 2018
10. **Dr. Palok Aich** has became Visiting Scientist, Vaccine and Infectious Disease Organization - Intervac, University of Saskatchewan, Canada, Summer 2018
11. **Dr. Palok Aich** has became Technical expert for BIRAC Seed funding, KIIT -TBI, Feb 5, 2018
12. **Dr. Debasmita P. Alone** has became Expert Committee Member, NPDF and Early Career Grants, SERB
13. **Dr. Harapriya Mohapatra** has received several recognitions from national and international journals such as International Journal of Antimicrobial Agents, Microbial Insights, Journal of Global Antibiotic Resistance, Current Science.
14. **Dr. K.C. Panigrahi** has received Syamprabha Digdarshak Award 2019
15. **Dr. K.C. Panigrahi** has received the ERASMUS k107 Grant of European Union.
16. **Dr. K.C. Panigrahi** has become the Member of iMoss international society.

17. **Dr. Manjusha Dixit** has judged poster award session at "International Congress of Cell Biology"- CCMB Jan 27-31, 2018, Hyderabad.
18. **Dr. P.V. Alone** has Chaired a session, 2nd Symposium of NII Alumni Association, Sept 30th 2018, National Institute of Immunology, New Delhi.
19. **Dr. Shymasree Ghosh** has received an award in writing Essay competition in Vigilance Awareness week, in NISER, 2018
20. **Dr. Shymasree Ghosh** has received an award for talk on Vigilance Awareness week, in NISER, conducted by State bank of India, NISER campus, 2018
21. **Dr. Saurabh Chawla** has been selected by AAALAC International, USA as an Ad-hoc specialist (site visitor)

## Awards and Honors received by the SBS Students

1. Mr. Pragyesh Dixit won a prize for poster presentation at 14th Indo -Australian Biotechnology Conference on "Emerging Modalities to Improve Cancer Outcomes", ACTREC, Navi Mumbai, MH, India, 22-23 Oct 2018
2. Mr. Shrikant B Kokate successfully defended PhD viva voce and joined University of Helsinki, Finland, as a postdoctoral fellow
3. Dr. Mitali Mishra has received best poster award at the 59th Annual meeting of Association of microbiologists (AMI), INDIA held at University of Hyderabad from 9th -12thDecember 2018.
4. Best Poster Award" to Ms. Bratati Mukherjee. International symposium on 'Tumor Microenvironment and Cancer Prevention and Therapeutics'. Organized by School of Life Sciences, Jwaharlal Nehru University, New Delhi. February 08 -09, 2019
5. Travel award to Md. Khurshidul Hassan. International Congress of Cell Biology 2018. Organized by CCMB Hyderabad. 27th Jan-31st Jan.

## Conferences, Seminars, Workshops attended

1. **Dr. Aniruddha Datta Roy** was invited as a resource person at DBT sponsored workshop titled "Molecular taxonomy" at Institute of Life Sciences (ILS), Bhubaneswar, March 11 – 15, 2019.
2. "Regulation of AAA+ ATPase ATAD2 Expression in Hypoxic Gastric Cancer Cells". Nayak, A, Poirah, I, Bhattacharyya, A, **Rouchowdhury, A**. 4th International Conference on Translational Research: Recent Developments and Innovations in Human Health and Agricultural Research, Bogmalo, Goa, India, 11-13 Oct 2018
3. "Generation of reactive oxygen species in Helicobacter pylori -infected gastric epithelial cells is associated with Siah proteins". Dixit P, Kokate, SB, Poirah, I, Roy AD, Chakraborty, D, Rout, N, Singh, SP, **Bhattacharyya, A**. 4th International Conference on Translational Research: Recent Developments and Innovations in Human Health and Agricultural Research, Bogmalo, Goa, India, 11-13 Oct 2018
4. "Helicobacter pylori increases reactive oxygen species burden of infected gastric epithelial cells via involvement of Siah proteins". #Dixit P, Kokate, SB, Poirah, I, Roy AD, Chakraborty, D, Rout, N, Singh, SP, **Bhattacharyya, A**. 14th Indo-Australian Biotechnology Conference on "Emerging Modalities to Improve Cancer Outcomes", ACTREC, Na vi Mumbai, MH, India, 22-23 Oct 2018
5. "Regulation of AAA+ ATPase ATAD2 Expression in Hypoxic Gastric Cancer Cells". Nayak, A, Poirah, I, **Bhattacharyya, A,** Roychowdhury, A. 4th International Conference on Translational Research: Recent Developments and Inno vations in Human Health and Agricultural Research, Bogmalo, Goa, India, 11-13 Oct 2018

6. **Dr. KVS Badireenath** has attended Cell-based Vehicles as tools for drug development and therapy: Opportunities and Challenges conference during Mar 02-03, 2019 at Institute of Pharmacy & Technology, Salipur, Odisha, India.
7. **Dr. KVS Badireenath** has attended 3rd IAPST International Conference. Jan 19-20, 2019. Centurion University, Bhubaneswar, India.
8. **Dr. Chandan Goswami** has attended Electron Microscopy Society of India (EMSI) pre-conference workshop in Light microscopy and live cell imaging. NISER, Bhubaneswar, 16th July 2018.
9. **Dr. Chandan Goswami** has attended International Conference on Microscopy and XXXIX annual meeting of Electron Microscope Society of India, Bhubaneswar, Mayfair lagoon 18-20th July 2018
10. **Dr. Chandan Goswami** has attended 3rd International Conference on Nutraceuticals and Chronic Diseases' under the aegis of International Society of Nutraceuticals and Chronic Diseases, Swami Rama Himalayan University, Dehradu n, India,14-16th Sept 2018
11. **Dr. Chandan Goswami** has attended Deutscher Akademischer Austausch Dienst (DAAD) Research Ambassadors Meet 2018, The Lalit Hotel and German Embassy, New Delhi, 20 - 22 September
12. **Dr. Chandan Goswami** has attended INSCR International conference 2018 (IIC-2018) on Trends in Biotechnology for innovations in Health and Environment. At KIIT University, Bhubaneswar, 26-27th Sept 2018
13. **Dr. Chandan Goswami** has attended EMBO Workshop on "ER function in health and disease" in Lucca, Italy, 21-26th Oct 2018
14. **Dr. Chandan Goswami** has attended 20th Odisha Bigyan 'O' Paribesh Congress (OBPC), in NISER, Jatni, Bhubaneswar, November 17 -18, 2018
15. **Dr. Chandan Goswami** has attended an International Conference and Expo On Innovation In Materials Science & Te chnology, AMITY University, Kolkata, 14 -16 Dec 2018
16. **Dr. Chandan Goswami** has attended Zeiss end-users meeting, 11-13th Feb 2019, Bangalore
17. **Dr. Chandan Goswami** has attended 4th Orientation Workshop on Laboratory Animal Sciences Jointly organized by NISER and ILS Bhubaneswar, 11-15th March 2019, NISER-Bhubaneswar (13th March 2019)
18. **Dr. Subhasis Chattopadhyay** has attended the International Conference on Immunology (ICI-2018), Department of Biotechnology, SRM Institute of Science and Technology, Kattankulathur-603203, Tamil Nadu, India, held on September 26th to 28th , 2018
19. **Dr. Subhasis Chattopadhyay** has attended the INTERVIROCON 2018 at PGIMER, Chandigarh, India, 27th International conference in the series hosted by the Department of Virology, Postgraduate Instit ute of Medical Education and Research. Chandigarh, held on 10th -14th November, 2018 with the theme: "Global Viral Epidemics: A Challenging Threat
20. **Dr. Subhasis Chattopadhyay** has attended the National Seminar on "Future India: Science and Technology" 1st –2nd February, 2019 at KIIT-DU, Bhubaneswar organized by Indian Science Congress Association (ISCA), Bhubaneswar Chapter
21. Dr. Palok Aich has attended a Conference on "EPIGENETICS AND HUMAN DISEASE" organized by the Japan-India Forum for Advanced Study, Feb 07-09, 2018, Bose Institute, Kolkata, India

22. **Dr. Palok Aich** has attended GATC 2018 the Genomics Analysis and Technology Conference, Jan 7th - 9th, 2018, Institute of Science & Technology, Gauhati University & GATC
23. **Dr. Debasmita P. Alone** has attended Indian Eye Research Group (IERG-ARVO) 2018 for which my student, Ms. K. Ramani Shyam received Travel Award.
24. **Dr. Harapriya Mohapatra** has attended 22nd International Symposium on Antibiotic Resistance – One Health Perspective (AROHP-2019) at Department of Biotechnology, IIT Roorkee, India from 5th to 8th March 2019.
25. **Dr. K.C. Panigrahi** has attended International conference on Microscope XXXIX Annual meeting of EMSI of India, July 2018.
26. **Dr. Manjusha Dixit** has attended 4th International Conference on Translational Rese arch: Recent Developments and Innovations in Human Health and Agricultural Research. Organized by NCCS/NCI/ IBSD, Goa 11th13th October, 2018.
27. **Dr. Manjusha Dixit** has attended 5th international conference on angiogenesis research: targated angiogenesis therapy (Angio-2018). Organised by Department of Stem cell and Regenerative Medicine Centre for Interdisciplinary Research D. Y. PATIL Education Society and National Centre for Cell Science, Pune, India Kolhapur, October 26 -27, 2018.
28. **Dr. Manjusha Dixit** has attended Rational pharmacotherapy – ensuring universal access. 10th Annual National Conference of Indian Society for Rational Pharmacotherapeutics (ISRPTCON2018), Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, 24th & 25th Nov, 2018.
29. **Alone PV**, (Sept 4-8th 2018) Translation Control conference, Cold Spring Harbor Laboratory, New York: Ribosomal mutation in helix 32 of 18S rRNA alters fidelity of eukaryotic translation start site selection.
30. **Dr. R Srinivasan** has attended National Workshop on Genomics for Microbial Diversity and Taxonomy, 21st – 25th January, NIT, Rourkela
31. **Dr. R Srinivasan** has attended Biological Transactions: From Molecules to Organisms, 2019, 17th – 20th Jan, Indian Institute of Science.
32. **Dr. R Srinivasan** has attended Soft Matter Young Investigator Meet 2018, 23rd – 25th May, Koti Resorts, Simla. India 2018.
33. **Dr. R Srinivasan** has attended Living Matter- 2018, 16th – 26th April, 2018. International Centre for Theoretical Sciences, TIFR.
34. **Dr. Abdur Rahaman** has attended a conference on Ciliate Molecular Biology 2018 organised by Genetic Society of America, American University, USA 17 -22 July 2018
35. **Dr. Praful Singru** has attended a Conference at Humbolt Kolleg on Comparative Endocrinology and Physiology, Department of Zoology, RTM Nagpur Univers ity, Nagpur, January 7-9, 2019.
36. **Dr. Tirumala K Chowdary** has attended the 14th International Conference for Vector and Vector Borne Diseases (ICOV-14), 9-11 January 2019, Bhubaneswar

## Invited Talks Given

1. **Dr. Aniruddha Datta Roy** has given an invited talk at IISER Berhampur on 12-02-2019. Talk Title: **Unravelling historical biogeographic patterns of the Indian subcontinent using skinks as a model system.**

2. **Dr. Asima Bhattacharyya** was invited for a **Motivational Talk**: "Expand your horizons". VigyanJyoti, IIT-Bhubaneswar, June 4-24, 2018
3. **Dr. Asima Bhattacharyya** has given an invited talk on "Role of Siah proteins in Helicobacter pylori-mediated gastric cancer". Dept. of Cell Biol&Mol Genetics, University of Maryland, Washington DC, USA, 12 July, 2018
4. **Dr. Asima Bhattacharyya** has given an invited talk on "Histone acetyltransferase inhibitor CTK7A decreases the invasive potential of gastric cancer cells". Kokate, SB, Dixit P, Roy AD, Poirah, I, Chakraborty, D, Rout, N, Singh, SP, Bhattacharyya, A. 4th International Conference on Translational Research: Recent Developments and Innovations in Human Health and Agricultural Research, Bogmalo, Goa, India, 11-13 Oct 2018
5. **Dr. KVS Badireenath** has given an invited talk on "Cell-based pre-formulation studies for selection of drug combination". Cell-based Vehicles as tools for drug development and therapy: Opportunities and Challenges. Mar 02-03, 2019. Institute of Pharmacy & Technology, Salipur, Odisha, India.
6. **Dr. KVS Badireenath** has given an invited talk on "Targeting chemorefrac tory B-Raf mutations with Benzo[alpha]phenoxazine. 3rd IAPST International Conference. Jan 19 -20, 2019. Centurion University, Bhubaneswar, India.
7. **Dr. KVS Badireenath** has given an invited talk on Life under water". Nov 12, 2018. Regional Science Centre. Bhubaneswar, India.
8. **Dr. Chandan Goswami** has given an invited talk at Delhi IIT, 21ST June 2018, Title: Exploring TRP ion channels: Aiming for bone tissue engineering
9. **Dr. Chandan Goswami** has given an invited talk in Electron Microscopy Society of India (EMSI) pre-conference workshop in Light microscopy and live cell imaging. NISER, Bhubaneswar, 16th July 2018. Title: 400 Years of light microscopy and biology
10. **Dr. Chandan Goswami** has given an invited talk in the International Conference on Microscopy and XXXIX annual meeting of Electron Microscope Society of India, Bhubaneswar, Mayfair lagoon 19th July 2018 Title: TRPV4 interacts with mitochondrial proteins and acts as a mitochondrial structure-function regulator
11. **Dr. Chandan Goswami** has given an invited talk at the 3rd International Conference on Nutraceuticals and Chronic Diseases' on September 14-16, 2018 under the aegis of International Society of Nutraceuticals and Chronic Diseases, Swami Rama Himalayan University, Dehradun, India,16th Sept 2018 Title: Agents for naturopathy: Plant and natural products as modulators of TRP channels
12. **Dr. Chandan Goswami** has given an invited talk at INSCR International conference 2018 (IIC-2018) on Trends in Biotechnology for innovations in Health and Environment. At KIIT University, Bhubaneswar, 27th Sept 2018 Title: Molecular basis of TRPV ion channel induced genetic disorders
13. **Dr. Chandan Goswami** has given an invited talk in the International Conference and Expo On Innovation in Materials Science & Technology, AMITY University, K olkata, 14-16 Dec 2018 Title: Cold-sensitive channel TRPM8 is endogenously expressed in osteoblasts and potential application of CMT-hydrogel-mediated release of TRPM8 agonists/ antagonists for osteoblast differentiation and mineralization
14. **Dr. Chandan Goswami** has given an invited talk in the Zeiss end-users meeting, 11-13th Feb 2019, Bangalore, 12th Feb 2019, Bangalore Title: TRPV channel-induced pathophysiology and microscopy
15. **Dr. Chandan Goswami** has given an invited talk at Regional Science Centre, Bhubaneswar, Science day celebration, 28th Feb 2019, Title: Milestones in modern Biology and few path breakers and bioinformatics
16. **Dr. Chandan Goswami** has given an invited talk at Animal workshop 13th March 2019, 4th Orientation Workshop on Laboratory Animal Scien ces Jointly organized by NISER and ILS

Bhubaneswar, 11-15th March 2019, NISER-Bhubaneswar. Title: Pain and pathophysiology: Importance of TRP channels and animal models

17. **Dr. Chandan Goswami** has given an invited talk at Anna University, Chennai, India 20th March 2019 Title: Molecular evolution of TRPV1 at the lipid-water interface and Cholesterol
18. **Dr. Subhasis Chattopadhyay** has given an invited talk at International **Conference on Immunology (ICI-2018),** Department of Biotechnology, SRM Institute of Science and Technology, Kattankulathur-603203, Tamil Nadu, India, held on **26th to 28th September, 2018**.
19. **Dr. Subhasis Chattopadhyay** has given an invited talk at **INTERVIROCON 2018 at PGIMER**, **Chandigarh, India**, 27th International conference in the series hosted by the Department of Virology, Postgraduate Institute of Medical Education and Research. Chandigarh, held on **10th -14th November, 2018** with the theme: "Global Viral Epidemics: A Challenging Threat.
20. **Dr. Subhasis Chattopadhyay** has given an invited talk at National Seminar on "Future India: Science and Technology" **1st –2nd February**, 2019 at KIIT-DU, Bhubaneswar organized by **Indian Science Congress Association (ISCA)**, Bhubaneswar Chapter.
21. **Dr. Palok Aich** has given an invited talk on Role of probiotic on disease control. Medical Academy of Sofia, Bulgaria, Sep 26 2018
22. **Dr. Palok Aich** has given an invited talk on Affluence of Microbiota may be a luxury: Comes in plenty but a few may be required @ VIDO-Intervac, U of Saskatchewan, May 31 2018
23. **Dr. Palok Aich** has given an invited talk in DST Inspire, @ KSBT, KIIT, Bhubaneswar, Odisha, India, Feb 23, 2018,
24. **Dr. Palok Aich** has given an invited talk on Technical Writing @ KSBT, KIIT, Bhubaneswar, Odisha, India, Feb 12, 2018
25. **Dr. Debasmita P. Alone** has given an invited talk on Dihydroartemisinin rescues brain tumour in Drosophila and Rat model, 13th June, 2018, Vigyan Jyoti, IIT, Bhubaneswar.
26. **Dr. Debasmita P. Alone** has given an invited talk on Drosophila as a model for screening anti-cancer drugs, 18th January, 2019, In Search, JN CASR, Bangalore.
27. **Dr. Debasmita P. Alone** has given an invited talk on Novel insights into altered gene regulation underlying disease pathogenesis of pseudoexfoliation glaucoma, 7th International conference of Molecular Signalling, 24th January, 2019, Savitr ibai Phule Pune University, Pune.
28. **Dr. Debasmita P. Alone** has given an invited talk on Screening of Natural products as anti-cancer agents, 28th February, 2019, National Science Day Celebration, Institute of Physics, Bhubaneswar.
29. **Dr. Debasmita P. Alone** has given an invited talk on Panel Discussion on "Career and Entrepreneurship for Women Scientists", 8th March, 2019, on Women's Day celebration, Institute of Life Sciences, Bhubaneswar.
30. **Dr. Harapriya Mohapatra** has given plenary lecture entitled 'Antimicrobial resistance: A perspective on eARB vis-à-vis pARB', at 22nd International Symposium on Antibiotic Resistance – One Health Perspective (AROHP-2019) at Department of Biotechnology, IIT Roorkee, India from 5th to 8th March 2019.
31. **Dr. Harapriya Mohapatra** has given a talk titled 'Invisible Wonders! The amazing world of bacteria' on 21st June 2018 at Vigyan Jyoti programme at IIT, Bhubaneswar
32. **Dr. Kishore CS Panigrahi** has given a talk on Plant responses to light and stress, Emerging issues in climate change. ICGEB, New Delhi, October 10-14, 2018.
33. **Dr. Kishore CS Panigrahi** has given a talk in the annual Conference of Odisha VigyanParivesh, Bhubaneswar, Dec 2018.

34. **Dr. Kishore CS Panigrahi** has given a talk in the 43rd Ann. conference of Odisha Botanical Society and National Conference, December 2018.
35. **Dr. Kishore CS Panigrahi** has given a talk in the National Conference on Biodiversity, Biotechnology and Bio-informatics, Innovative and Emerging trends, February 22 - 23, 2019
36. **Dr. Kishore CS Panigrahi** has given a talk in the International symposium on Biotechnology for food nutritional Security and organic agriculture, Jorhat, 25 -26, March 2019.
37. **Dr. Kishore CS Panigrahi** has given a talk on "Biotechnology in the perspective of climate change", RD university, Bhubaneswar. Emergin g trends in Life sciences for sustainable Development, February 8-9, 2019.
38. **Dr. Renjith Mathew** was invited for a seminar in workshop on "Advances in Biotechniques", The Department of Biotechnology, Utkal University, 07.12.2018.
39. **Dr. Renjith Mathew** was invited for a Seminar at the Developmental Biology Unit, European Molecular Biology Laboratory, Heidelberg, Germany, 16.01.2019.
40. **Dr. Renjith Mathew** was Invited seminar in "Zeiss Microscopy Conclave 2019" Bangalore, 15.02.2019
41. **Dr. P.V. Alone** has given an invited talk on 1st Oct 2018 at Regional Center for Biotechnology, Faridabad, Understanding the fidelity of eukaryotic translation start site selection
42. **Dr. R Srinivasan** was invited for a talk at National Workshop on Genomics for Microbial Diversity and Taxonomy, 21st – 25th January, NIT, Rourkela. Bacterial Cytoskeleton: Diversity and Assembly Dynamics. India 2019.
43. **Dr. R Srinivasan** was invited for a talk Living Matter- 2018, 16th – 26th April, 2018. International Centre for Theoretical Sciences, TIFR. The importa nce of Being in Shape: Lessons from Bacteria and Yeasts.
44. **Dr. Shymasree Ghosh** has given a Popular talk on Life and Work of Sir JC Bose: Venue: Regional Science centre, Bhubaneswar, National Council of Science Museum, Ministry of Culture, Govt of India.dated 30:11:2018
45. **Dr. Saurabh Chawla** has given an invited talk on "Animal Ethics, Role of IAEC and Importance of 3R's in Animal Experimentation". Continuing Education Programme, sponsored by Pharmacy Council of India, New Delhi organized at CIPT & AHS Banitabla, Uluberia, Howrah on 27th – 29th September, 2018
46. **Dr. Saurabh Chawla** has given an invited Popular talk on "Man and Animals-Interrelationship and Coexistence" at Regional Science Centre, Bhubaneswar.
47. Dr. Abdur Rahaman was invited for Plenary talk in Ciliat e Molecular Biology 2018 organised by Genetic Society of America, American University, USA 17 -22 July 2018
48. **Dr. Abdur Rahaman** has given an invited talks in Living Matter, ICTS Campus, Bangalore on April 16-26, 2018
49. **Dr. Praful Singru** has given an invited talk at HumboltKolleg on Comparative Endocrinology and Physiology, Department of Zoology, RTM Nagpur University, Nagpur, January 7-9, 2019.
50. **Dr. Praful Singru** has given an invited talk at International Brain Research Organization (IBRO)-APRC-Associate School in Neuroscience on 'Recent advances in tools and techniques in neuroscience research'. Department of Biotechnology, Pune University, Pune, India, March 26-31, 2018.
51. **Dr. T.K. Chowdary** has given an invited talk on "Dengue Non-structural protein interaction in replication complex" in the 14th International Conference for Vector and Vector Borne Diseases (ICOV-14) jointly organised by ICMR- Regional Medical research Centre, Bhubaneswar and NAVBD from 9-11 January 2019.

## Sponsored Projects

1. **Dr. KV. Badireenath**: Rapid Grant for Young Investigators (RGYI), DBT, India
2. **Dr. Chandan Goswami**
   a. "Role of TRPV ion channels in the regulation of mitochondrial function and dynamics relevant in the context of neuronal abnormality and other pathophysiological conditions" (DBT, 2015-18, As PI)
   b. Regulation of cytoskeletal components by TRPV receptors and vice versa relevant in cancer and neuropathic pain (DST, 2015-18, As PI)
   c. Synthesis and characterization of novel hydrogels and their interaction with cells for potential application in bone tissue engineering (ICMR, 2015-18. As Co-PI)
3. **Dr. Subhasis Chattopadhyay**
   a. IImmune regulatory role of TRPV in T cell activation and suppressive response" as PI funded by CSIR, India. [Co-PI- Dr. G. Goswami, SBS, NISER Bhubaneswar, Dr. S. Chattopadhyay, Institute of Life Sciences Bhubaneswar], 2016 -19.
   b. Identification and characterization of differentially expressed host proteins for both S 27 and DRDE-06 strains of Chikungunya virus in mouse model: Implications in understanding its epidemic potential. Dated 21 September, 2016, as Co-PI funded by Science & Engineering Research Board (SERB), India. [PI- Dr. S. Chattopadhyay, Institute of Life Sciences Bhubaneswar], 2016-19.
4. **Dr. Palok Aich**
   a. Global Travel Award, $ 2000, University of Saskatchewan, Canad a
   b. Research Grant of ₹33,38,400 as Principal Coordinator (PC) on Protective autophagy by secretory clusterin associated with cell survival and chemoresistance in oral cancer
   c. Research Grant as Co-PI of $19320 on Predictive Biomarkers of Cardiovascular Disease, College of Medicine Research and Development Grant (COMRAD), Canada
5. **Dr. Debasmita P. Alone**
   a. Microbes and Disease Biology, DAE (Intramural)
   b. ICMR (Extramural)
   c. 3. CSIR (Extramural)
6. **Dr. Harapriya Mohapatra**: Microbes, Immunity and Disease Biology, DAE (Intramural)
7. **Dr. Kishore CS Panigrahi**
   a. Role of the putative domains of GIGANTEA and their functions in Arabidopsis thaliana. SERB – (2016–19)
   b. Correlation of PhyB and Auxin in patterning the root development in Arabidopsis. (2017 - 2020)
8. **Dr. Praful Singru**: Department of Biotechnology (DBT), New Delhi, India - Anticipation in genes: Molecular, physiological and behavioral correlates of response of circa -annual clocks to seasons in night- migratory song birds.
9. **Dr. Rudresh Acharya**: Mechanistic insights into functioning of polysaccharide lyases (PLs) belonging to class 5 (PL 5) from pathogenic bacteria such as Ralstoniapickettii, Pseudomonas aeruginosa: Funded by DBT

**10. Dr. R. Srinivasan**

a. SERB-DST: EMR/2016/000487 - Assembly of Bacterial Cell Division Protein, FtsZ into Ring-like Structures: Cell Biological, Biochemical, Biophysical and Ultra-Structural Characterization of Novel Mutants trapped in a Helical Intermediate Stage of Z-ring Assembly. ₹ 7814600/-
b. DBT: BT/PR15183/BRB/10/1443/2015 - Assembly and Constriction of the Bacterial Cytokinetic Ring formed by the Tubulin homologue, FtsZ. ₹71,78,000.00 .

## Colloquium & Seminar Organized in SBS

1. **Colloquium by Prof. Dulal Panda**, IIT-Bombay, Mumbai on April 13th, 2018 Title: Centrosomal regulation of microtubule assembly and dynamics: Implications in cell division and cell motility
   **Seminar by Dr. Ramkumar Sambasivan**, INSTEM Bangalore on April 16th, 2018
   Title: Recapitulation of developmental cues to guide pluripotent stem cell differentiation into skeletal muscle
3. **Seminar by Prof. Aurnab Ghose**, IISER Pune on April 27th 2018 Title: "Formin"-links between the actin and microtubule cytoskeletons: implications for neuronal pathfinding
4. **Colloquium by Prof. Satyajit Mayor** (Director, NCBS) on August 17th Building an interdisciplinary research program to study life at the cell's edge
5. **Seminar by Prof. Sharmila Mande**, TCS on 17-Aug-2018 Title: Human microbiome and health
6. **Seminar by Dr Ramesh Yelagandula** (Institute of Molecular Biotechnology, Vienna Biocenter, Austria) on August 24th, 2018 Title: Novel molecular players in the maintenance of heterochromatin silencing
7. **Seminar by Dr. Saravanan Palani** (Centre for Mechanochemical Cell Biology and Division of Biomedical Sciences, on 29-Aug-2018, Title: Phospho-regulation of tropomyosin is crucial for actin filament turnover
8. **Seminar by Dr. Ganesh Bagler (Center for Computational Biology, IIIT-Delhi)** on: 10th September Title: Computational Gastronomy: The emerging data science of food, flavors, and health
9. **Seminar by Dr Jayanta Chatterjee**, MBU, IISc, on Sep 20, 2018, Title: Exploring the physicochemical and biological attributes of thioamidated peptides
10. **Seminar by Dr. Ananthalakshmy Sundararajan** (School of Biochemistry, Biomedical Sciences Building University of Bristol, Bristol) on 22nd October 2018 Title: Targeting Cancer Metastasis – Mechanistic insights into Anoikis-resistance and Tumour Angiogenesis
11. **Seminar by Dr. Om Rathore**, Aarhus University, Denmark on November 1, 2018 SBS Title: Regulation of pre-mRNA splicing during Drosophila development.
12. **Seminar by Prof. Dipankar Nandi** (Biochemistry, IISc), December 4th, 2018, Title of the talk: The 2018 Nobel Prize in Medicine: a personal perspective
13. **Seminar by Dr. Neeti Sanan Mishra** (ICGEB) on 31-Jan-2019 Title: Understanding the micro regulation of salt stress response in rice
14. **Seminar by Prof. Nitya Gopal Chakraborty** (Department of Medicine, University of Connecticut Heath Center, Connecticut, USA) on 16-Jan-2019, Title of the talk: Peripherally induced Tregs are the potential tolerance inducer for the growth and metastasis of cancer.
15. **SBS Seminar - Prof. Dr. Sanjib Kumar Panda** (Department of Life Science & Bioinformatics
    Assam University (a Central University) 31-Jan-2019 Title: Biotechnological Studies for Osmotic stress tolerance in Plants

16. **Colloquium by Prof. David Roper** (Univ. of Warwick) on 14-Mar-2019 Title: The relationship of bacterial cell wall synthesis to cell division and antibiotic resistance
17. **Seminar by Dr. Mithilesh Mishra** (DBS, TIFR-Mumbai) on March 19, 2019 Title: Sculpting the ring to make a cut: contractile ring structure and mechanism of cell division
18. **Seminar by Prof. Jacinta S. D'Souza** (SBS, CEBS, UM-DAE), on 28th March 2019 Title: 'Ciliary dysfunction: from relative obscurity to a formidable position

## Conferences, Workshops and Symposiums Organized

1. Electron Microscopy Society of India (EMSI) pre-conference workshop in Light microscopy and live cell imaging. NISER, Bhubaneswar, 16-17th July 2018. Convener: Dr. Chandan Goswami.
2. International Conference on Microscopy and XXXIX annual meeting of Electron M icroscope Society of India, Bhubaneswar, Mayfair lagoon 18-20th July 2018. Co-convener: Dr. Chandan Goswami.
3. 20th Odisha Bigyan 'O' Paribesh Congress (OBPC), in NISER, Bhubaneswar, 17-18 Nov, 2018. Co-Coordinator: Dr. Debasmita P. Alone
4. 34th Inter DAE Zonal Sports meet, Table Tennis event held on 9th and 10th October 2018 in NISER. Dr. Subhasis Chattopadhyay has served as Chairman, NISER Staff Gym Khana.
5. Training Programme for School Teachers under VigyanPratibha Initiative, Coordinator: Dr. Debasmita P. Alone.
6. NISER OPEN DAY as an outreach activity of NISER, Coordinator: Dr. Debasmita P. Alone .
7. Dr. R. Srinivasan has organized Soft Matter Young Investigator Meet 2018, 23rd – 25th May, Koti Resorts, Simla. India 2018.
8. **Contribution to mission "Skill India" the Fourth Orientation workshop on Lab Animal Sciences Jointly organized by NISER and ILS. Conveners - Dr. Saurabh Chawla Dr. Sarita Jena, Dr. B. Chandramohan during 11th to 15th March 2019.**

   **Brief Details**: A five-day intensive workshop on Laboratory Anim al Science was organized by NISER and ILS for research scholars, students and faculty involved in research with animals. The objective of this workshop was to prime researchers with basic facts and principles that are essential for the use and care of anim als in research. The contents of the workshop also covered the recommendations of the Committee for the purpose of Control and Supervision of Experiment on Animals (CPCSEA). Participants from NISER, ILS, OUAT, KIIT, medical colleges, pharmacy colleges, state universities and pharma industry participated in this event.
9. Training Programme "**Animal Handling and Restraint**", August 2018 was organized for the students of NISER at Animal House facility of SBS, NISER. More than 70 students participated in the event

## SCHOOL OF CHEMICAL SCIENCES

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| **Name of the Faculty** | **Prof.A. SRINIVASAN** |
| **Designation** | **Professor** |
| **Title of the Research** | Contracted and Expanded Carbaporphyrinoids |
| **Brief introduction of updated research work** | Our research interests are: (1) synthesis of contracted, normal and expanded derivatives of carbaporphyrinoids and explore its coordination chemistry as well as receptor properties;(2) synthesis of normal and expanded arene as well as pyridyl ring incorporated calixpyrrole, calixphyrins& their respective 3-D analogues and these macrocycles are further exploited for sensing experiments and (3) Metal assisted macrocyclic synthesis. |
| **Publications (F.Y 2018-19)** | 1. Homocarbaporphyrinoids: The m-o-m and p-o-p Terphenyl embedded expanded porphyrin analogue s and their Rh(I) complexes. B. Adinarayana, Mainak Das, C. H. Suresh and **A. Srinivasan. Chem Eur.** J.2019, 25, 4683-4687.<br>2. Di-(m-m-m) terphenyl Embedded Decaphyrin and its Bis-Rh (I) complex. Mainak Das, B. Adinarayana, M. Murugavel, S. Nayak and **A. Srinivasan. Org. Lett.2019**, 21, 2867-2871.<br>3. 24π Core-Modified NonfusedPentaphyrin with MöbiusAromaticity. Arindam Ghosh, S. Dash, **A. Srinivasan**, M. S. R. Sahu, C. H. Suresh and T. K. Chandrashekar. **Chem. Eur. J 2018**, 24, 17997-18002. |
| **Conferences and Seminars Attended** | 1. Main-group Molecules to Materials, IISc, Bangalore, 28th – 31st October 2018. |
| **Invited Talks** | 1. Invited talk; Title: Carbaporphyrinoids; IISER-Bhopal, 6th to 8th December 2018<br>2. Invited talk; Title: Carbaporphyrinods; IIT-Roorkee, 7th to 9th February 2019<br>3. Popular Lecture; Title: Metals in Medicine; VigyanJyoti program, IIT, Bhubaneswar, 5th – 24th June 2018 |
| **Sponsored Projects** | **Title:** Contracted & Expanded Porphyrin Analogues with Polycyclic Aromatic Units: Synthesis and Applications. **Budget**: Rs. 49.97 Lakhs; **Project Code**: EMR/2017/2932; **Funding Agency:** SERB, New Delhi. |

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| **Name of the Faculty** | **Dr. Arindam Ghosh** |
| **Designation** | **Reader-F** |
| **Title of the Research** | Methodology development for NMR spectroscopy |
| **Brief introduction of updated research work** | Our research group is involved in bringing out new and improved methodologies for NMR spectroscopy of small as well as large molecules. Currently we are working on methods to reduce spectral congestion, to improve spectral quality and fast measurement of data. |
| **Publications (F.Y 2018 -19)** | 1. Rabindra N. Pradhan, Subhayan Chakraborty, Pratibha Bharti, Janesh Kumar, Arindam Ghosh* and Akhilesh K. Singh*, **Dalton Transactions**, 48, 8899 (2019)<br>2. Aman K Naik, Uday Pandey, Raktim Mukherjee, SohiniMukhopadhyay, Subhayan Chakraborty, Arindam Ghosh and PalokAich*, **Toxicology Research**, 8, 361 (2019) |
| **Name of the Faculty** | **Dr. Bhargava B.L.** |
| **Designation** | **Associate Professor** |
| **Title of the Research** | Computational Modeling of Condensed Phase Systems. |
| **Brief introduction of updated research work** | Molecular simulations provide insights into the structure and dynamics of a system at atomic level helping to understand the system from a microscopic persepective. Using molecular simulations, it is possible to carry out controlled (virtual) experiments at extreme conditions without safety issues involved in carrying out the actual experiments. We use ab initio methods and empirical potential based molecular dynamics and Monte Carlo techniques to study condensed phases of materials. We explore structural and dynamical properties of materials that are of potential use. For systems exhibiting aggregation behavior beyond the length scales accessible to the atomistic simulations, coarse grained MD simulations are used. Biological systems such as proteins and lipids are also studied using molecular dynamics. |
| **Publications (F.Y 2018 -19)** | Self-assembly of cations in aqueous solutions of multiheaded cationic surfactants: All atom molecular dynamics simulation studies. Anirban Sharma and B. L. Bhargava, *J. Phys. Chem. B***122**, 10943-10952 (2018). |
| **Conferences and Seminars Attended** | National Bio-organic Chemistry Conference, December 2018, NISER – Bhubaneswar |

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| **Name of the Faculty** | **Dr. Bidraha Bagh** |
| **Designation** | **Assistant Professor** |
| **Title of the Research** | Small molecule activation and catalysis with transition metal complexes |
| **Brief introduction of updated research work** | Activation of small molecules by transition metal complexes is an active field of research. However, second - and third-row transition metals are expensive and rare and thus noble metal-based chemistry is not sustainable for long time. My research particularly aims at the utilization of earth-abundant, non-toxic and cheap first-row transition metals such as manganese, iron, cobalt, nickel and copper in cooperation with non-innocent ligands. The synthesized first-row transition metal complexes will be used for H -H, Si-H, B-H, O-H and N-H bond activation and variety of catalytic hydrofunctionalization reactions such as hydrogenation, hydrosilylation, hydroboration, hydroalkoxylation, hydroamination etc. will be targeted. |
| **Conferences and Seminars Attended** | National Bio-organic Chemistry Conference, NISER Bhubaneswar |
| **Sponsored Projects** | Early Career Research Award (SERB sponsored project) |

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| **Name of the Faculty** | **Dr. C. Gunanathan** |
| **Designation** | **Associate Professor** |
| **Title of the Research** | Organometallic Chemistry and Catalysis |
| **Brief introduction of updated research work** | Isolation and characterization of intermediates in catalytic processes are challenging owing to their inevitable low stability. However, overcoming this barrier and succeeding in this challenging task can turn out to be highly beneficial in further fine tuning and optimization of catalytic experiments, and for the fundamental understanding of reaction mechanisms.<br><br>Using half-sandwich ruthenium complexes as catalysts, efficient chemoselectivehydroelementation reactions such as hydroboration of carboxylic acids, olefins, nitriles and imines, pyridines, carbonyl compounds, and hydrosilylationof aldehydes were reported. The hitherto unknown intermediate involved in these hydroelementation reactions turned out to be an efficient catalyst for the selective -deuteration of amines and amino acids and in direct synthesis of borosilaxanes from boranes, silanes and water.<br><br>By employing Ru-MACHO pincer complex, that operate via amine-amide metal-ligand cooperation, simple and atom-economical direct deuteration of organic compounds using $D_2O$ as a direct deuterium source is developed. NH |

activation of amines by Ru-MACHO also established, which is assimilated in the catalytic synthesis of urea derivaties from amine and DMF (used as CO surrogate). Further, following the borrowing hydrogen concept and using alcohols as alkylating and olefinating reagents successful alkylation and olefination of nitrile compounds were developed. Recently, we have discovered a new coupling reaction: catalytic cross-coupling of secondary alcohols. Remarkably, water and liberated molecular hydrogen are the only byproducts in these transformations.

**Publications (F.Y 2018-19)**

1). Kishore, J.; Thiyagarajan, S.; Gunanathan, C. Ruthenium(II)-catalysed direct synthesis of ketazines using secondary alcohols **Chem. Commun.,** 2019, *55*, 4542-4545 Link

2). Thiyagarajan, S.; Gunanathan, C. Catalytic Cross-Coupling of Secondary Alcohols **J. Am. Chem. Soc.,** 2019, *141*, 3822-3827 Link

3). Gawali, S. S.; Gunanathan, C. Iron-catalyzed regioselectivecyclotrimerization of alkynes to benzenes **J. Organomet. Chem.** 2019, *881*, 139-149 Link (Invited article)

4). Krishnakumar, V.; Gunanathan, C. Ruthenium-Catalyzed Selective α-Deuteration of Aliphatic Nitriles using $D_2O$ **Chem. Commun.** 2018, *54*, 8705-8708 Link

5). Kisan, S.; Krishnakumar, V.; Gunanathan, C. Ruthenium-Catalyzed Deoxygenative Hydroboration of Carboxylic Acids **ACS Catal.** 2018, *8*, 4772-4776 Link

6). Chatterjee, B.; Gunanathan, C. Selective Deuteration of Organic Compounds Catalyzed by Ruthenium Pincer Complexes. David Morales-Morales (Ed.) *Pincer Compounds: Chemistry and Applications* Elsevier. Amsterdam (2018) pp. 519-538. Link

**Invited Talks**

1). Green Catalytic Transformations.International Conference of Chemicals Sciences and Nanomaterials (ICCSN-2019), School of Advanced Sciences, VIT, Vellore, 7 -9 March 2019.

2). Hydroelementation and Sustainable Catalysis. International Conference on Advanced Materials Chemistry at the Interfaces of Energy, Environment and Medicine, Manonmaniam Sundaranar University, Tirunelveli, 30-31, January 2019.

3). Green Catalytic Transformations. International Conference on Organometallics and Catalysis (ICOC)-2018, Holiday Inn Resort, Goa, Dec. 13-16, 2018.

4). Catalytic Hydroelementation Reactions. International symposium on Main-group Molecules to Materials (MMM-18), Department of Inorganic and Physical Chemistry (IPC), Indian Institute of Science (IISc), Bangalore, 28th-31st October, 2018.

5). Hydroelementation and Sustainable Catalysis. **Plenary Lecture** at National Conference on Molecules and Materials for Sustainable Development(NCMM-18), Division of Chemistry, Karunya Institute of Technology and Sciences, Coimbatore. 6th April 2018.

**Sponsored Projects**

*Catalytic Activation and Direct Coupling of Ammonia with Arenes and Alkenes by Pincer Complexes (Sept 2017 to August 2020),* Science & Engineering Research Board (SERB), New Delhi. Sanctioned amount: 49,89,600/-.

**Name of the Faculty** **Dr. Chandra Shekhar Purohit**

**Designation** **Associate Professor**

**Title of the Research** Organic synthesis, Molecular Capsules and architecture

**Brief introduction of updated research work**

My research area focusses on synthesis of moclecular capsule based on CTV derivative to make capsule like structure that can host small molecules inside. Along with his, we are in a process if synthesis of molecular architectures like higher order catenanes.

**Publications (F.Y 2018-19)**

1. Heterometallic Coordination Polymers with Pyrazine 2, 6-Dicarboxamide: Sequential Metallation of Co (III) and Ag (I), S Prusty, CS Purohit, C**hemistrySelec**t 3 (28), 8051-8055
2. A Molecular Figure of Eight: Synthesis and Characterization, S Prusty, MB Podh, CS Purohit, **ChemistrySelect** 3 (33), 9690-9693.

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| **Name of the Faculty** | **Dr. Himansu Sekhar Biswal** |
| **Designation** | **Associate Professor** |
| **Title of the Research** | Spectroscopy and Computational Chemistry |
| **Brief introduction of updated research work** | **Himansu S. Biswal**obtained his Ph. D. from Tata Institute of Fundamental Research (TIFR), Mumbai, India, where he worked with Professor Sanjay Wategaonkar studying the sulfurcentered hydrogen bonds with supersonic-jet spectroscopy. He was a postdoctoral fellow with Professor Michel Mons at CEA, Saclay, France, where he investigated structure and ultrafast excited state dynamics of peptides. Then he moved to Prof. Jennifer P. Ogilvie's research group at University of Michigan, USA to work on 2D - electronic spectroscopy. In 2012, he joined in the school of Chemical Sciences, National Institute of Science Education and Research (NISER). Currently the group is working on 2 major problems<br>**(1) Unusual non-covalent interactions in biomolecules.**<br>**(2) Implications of aminoacid based ionic liquids in catalytic activity, stability, dissolution, and storage of DNA, RNA and proteins**.<br>The group uses both experimental techniques such as frequency and time resolved fluorescence spectroscopy, gas phase laser spectroscopy, NMR etc. and theoretical methods such as electronic structure calculation, molecular dynamics, docking etc. to investigate the mentioned problems at the molecular level. |
| **Publications (F.Y 2018-19)** | **(1)** "A liquid crucible model for aggregation of phenylacetylene in the gas phase." S. Mishra, D. K. Sahoo, Po-Jen Hsu, Y. Matsuda, Jer-Lai Kuo, **H. S. Biswal***and G. N. Patwari*; **Phys. Chem. Chem. Phys**., (2019), doi: 10.1039/C8CP07738J.<br>**(2)** "Nature and Strength of M-H···S and M-H···Se (M=Mn, Fe & Co) Hydrogen Bond." D. K. Sahoo, S. J ena, J. Dutta, A. Rana, and **H. S. Biswal*; J. Phys. Chem. A**, (2019), 123, 2227-2236. **(Published as part of J. Phys. Chem. virtual special issue "Young Scientists".)**<br>**(3)** "Noncovalent Carbon Bonding Interactions in Proteins." V. R. Mundlapati, D. K. Sahoo, S. Bhaumik, S. Jena, A. Chandrakar, and **H. S. Biswal***; Angew. **Chem. Int. Ed**., (2018), 57, 16496-16500.<br>**(4)** "Critical Assessment of the Interaction between DNA and Choline Amino Acid Ionic Liquids: Evidences of Multimodal Binding and Stability Enhancement." D. K. Sahoo, S. Jena, J. Dutta, S. Chakrabarty, and **H. S. Biswal*; ACS Central Science,** (2018), 4, 1642-1651.<br>**(5)** "Kinetics and mechanistic study of the reduction of Mn (III) by oxalate in Salophen scaffold: relevance to oxalate oxidase." P. Jena, A.N Acharya, V Rao Mundlapati, A. C Dash, and **H. S. Biswal*; J. Chem. Sci**. (2018), 130, 123.<br>**(6)** "Electron Transfer Dissociation of Synthetic and Natural Peptides Containing Lanthionine/Methyllanthionine Bridges." A. B. Dolle, N. Jagadeesh, S. Bhaumik, S. Prakash, **H. S. Biswal*,** and K. H. Gowd*; **Rapid Commun. Mass Spectrom.,** (2018), 32, 831-843. |
| **Awards and Honours** | **Dr. Himansu S. Biswal** was selected as a member of the editorial board of "BigyanDiganta", a monthly Odia magazine published by Odisha Bigyan Academy. |

**Conferences and Seminars Attended** Spectroscopy and Dynamics of Molecules and Clusters (SDMC-2019), February 21-24, 2019, Shimla, INDIA.

**Invited Talks** "Hydrophobic Interaction: An Effect of Many Non-covalent Interactions", 20-02-2018; Nimapada College, Nimapada, ODISHA

**Sponsored Projects** "Electronic and Vibrational Spectroscopic Investigations of Thioamides as Potential Surrogates of Amides in Peptides"."Funding Agency: DST-SERB, Duration: 2017 – 2020, (Project File No: **CRG/20l8/000892**; Grant amount: Rs, 53,22,140/-)

**Name of the Faculty** **Dr. Jogendra Nath Behera**

**Designation** **Associate Professor**

**Title of the Research** Inorganic and Materials Chemistry

**Brief introduction of updated research work**

1. **Electrocatalytic Metal-Organic Frameworks (MOFs) for Energy Applications:** Variety of MOFs are being prepared and tested as electroactive materials for Oxygen, Hydrogen Evolution and Reduction Reactions.
2. **Supercapacitors for layered composite Materials:** Layered composite materials of metal chalchogenides with reduced graphene oxide are being prepared and their supercapacitor capacity is being tested, as these materials shows potential applications in storage devices.
3. **Porous Magnetic Materials:** My group is focusing on synthesizing materials that are both porous as well as magnetic because of their potential applications in separation of air and absorption of oxygen from air in a non-cryogenic process
4. **Organic-Inorganic hybrid materials:** Organic-inorganic hybrid open-framework materials of sulfates and sulfites with the layered and three-dimensional structures are being synthesized and characterized.

   **All the materials synthesised are being characterized by various trchniquesusing** X-ray Diffractometer (single crystal and powder), SQUID Magnetometer, Gas Adsorption and separation (Micrometrics), TGA, DSC, NMR, UV-VIS, FT-IR, NMR, Conductivity, Potentiometry, EDX, SEM, TEM, GCMS, HPLC and Confocal Microscope.

**Publications (F.Y 2018-19)**

1. R. K. Tripathy, A. K. Samantara and J. N Behera, Cobalt Metal Organic Framework (Co-MOF): A bi-functional Electro active material for Oxygen Evolution and Reduction Reaction, *Dalton Trans.*, **2019**, *48*, DOI: 10.1039/C9DT01730E

2. S. S. Mondal, M. Chatterjee, R. K. Tiwari, J. N. Behera, N. Chanda, S. Biswas, and T. K. Saha, Hexanuclear Zn(II) and Mononuclear Cu(II) Complexes containing Imino Phenol Ligands: Exploitation of their Catalytic and Biological Perspectives, *ApplOrganometal Chem.*, **2019,** DOI: 10.1002/aoc.5011.
3. R. K. Tiwari and J. N. Behera, Hybrid materials based on transition Metal-BTC-Benzimidazole: Solvent assisted crystallographic and structural switching, *CrystEngComm*, **2018,** *20*, 6602.
4. J. K. Das, A. Samantara, A. K. Nayak, D. Pradhan and J. N. Behera, VS2: An Efficient Catalyst for Electrochemical Hydrogen Evolution Reaction in Acid Medium, *Dalton Trans.*, **2018**, *47*, 13792 (Cover Page).
5. A. S. Singh, A. Ali, R. K. Tiwari, M. M. Lee, J. N. Behera, S.-S. Sun and V. Chandrashekhar, Thermally Induced 1D to 2D Polymer Conversion Accompanied by Major Packing Changes in a Single-Crystal-to-Single-Crystal Transformation, *CrystEngComm*, **2018,** *20*, 2346.
6. R. Gupta, S. Prabhakar, I. Khan, J. N. Behera and F. Hussain, Early lanthanoid substituted organic-inorganic hybrids of silico-and germano-tungstates: Synthesis, crystal structure and solid state properties, *Indian J. Chem.*, **2018,** *57A,* 52.
7. S. R. Marri, R. K. Tiwari, N. Chauhan, J. Kumar and J. N. Behera, Two novel 3D-MOFs (Ca-TATB and Co-HKUST): Synthesis, Structure and Characterization, *Inorg. Chim.Acta*, **2018**, *478*, 8.

**Conferences and Seminars Attended**

1. (**ISFM-2018**): Energy and Biomedical Applications, **April 13-15, 2018**, **Punjab University, Chandigarh.**
2. (NSEMD-2018), Sept. 28-29, 2018, CSIR-CSMCRI, Bhavanagar
3. . International meeting on energy storage devices-2018, **December 10-12, 2018**, IIT Roorkee.
4. Frontiers in 2D materials from Basic Science to Real Time Applications, **March 13-16, 2019,** CNMS, Jain University, Bengaluru.

**Invited Talks**

1. Hybrid Materials for Clean Energy Applications, International Symposium on Functional Materials (**ISFM-2018**): Energy and Biomedical Applications, **April 13-15, 2018**, **Punjab University, Chandigarh.**
2. MOFs Electrocatalyst for water splitting, National Symposium on Electrochemistry in Materials and Devices (NSEMD-2018), Sept. 28-29, 2018, CSIR-CSMCRI, Bhavanagar.
3. Vanadium Chalcogenides-RGO/CNTs Hybrids for High EnergySupercapacitors and Electrochemical Hydrogen Evolution Reaction. International meeting

on energy storage devices-2018, **December 10-12, 2018**, IIT Roorkee.

4. Vanadium Chalcogenides-RGO/CNTs Hybrids as SupercapacitorandElectrocatalyst. Frontiers in 2D materials from Basic Science to Real time Applications, **March 13-16, 2019,** CNMS, Jain University, Bengaluru.

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| **Name of the Faculty** | **Dr. Moloy Sarkar** |
| **Designation** | **Associate Professor** |
| **Title of the Research** | Understanding the behavior of some liquid and solid nanostructured material by using steady state and time-resolved fluorescence spectroscopy. |
| **Brief introduction of updated research work** | We are mainly interested in understanding the important photo-processes such as electron transfer, energy transfer etc between water soluble quantum dots and organic dye molecules. To achieve that several quantum dots are synthesized in aqueous medium and characterized by spectroscopic and microscopic techniques and the said photophysical processes are investigated by examining the spectral and temporal behaviour of the systems using steady state and time-resolved absorption and fluorescence techniques. The outcomes of these studies are expected to be useful in both energies related and biological applications. We also to try to understand the microscopic behaviour of complex fluids such as room temperature ionic liquids and deep eutectic solvents as proper understanding on these specialized media will be helpful for these systems to be used in avenues such as catalysis, lithium ion batteries etc. Several spectroscopic techniques such as NMR, EPR fluorescence correlation spectroscopy time-resolved fluorescence anisotropy are used during the investigations. Since ionic liquids are also being used in many biological applications, we are also trying to understand the ILs-biomolecules interactions by using usual ensemble-averaged and single molecules spectroscopic techniques. |
| **Publications (F.Y 20 18-19)** | (1) Electrostatically driven Forster Resonance Energy Transfer between a Fluorescent Metal nanoparticle and J-aggregates in an Inorganic - Organic Nanohybrid material. A. K. Agrawal, P.K. Sahu, S. Seth and **M. Sarkar**, J. Phys. Chem. C,**2019**,123,3836-3847.<br>(2) Probing the Interactions of 1-alkyl-3-methylimidazolium Tetrafluoroborate (Alkyl = Octyl, Hexyl, Butyl and Ethyl) Ionic Liquids with Bovine Serum Albumin: An Alkyl Chain Length Dependent |

Study. Mullah Muhaiminul Islam, SahadevBarik, and **M. Sarkar**. J. Phys. Chem. B, **2019**,123,1512-1526.

(3) Probing the Aggregation and Signalling Behavior of some Twisted 9,9'-Bianthryl Derivatives: Observation of Aggregation-Induced Blue-Shifted Emission. S. Banerjee, A. K. Both and **M. Sarkar**, ACS Omega.**2018,** 3, 15709-15724. (Invited Article)

(4) Understanding the Microscopic Behaviour of Binary Mixturs of Ionic Liquids through Various Spectroscopic Techniques. M. Chakraborty, T. Ahmed, R. S. Dhale, D. Majhi and **M. Sarkar.** J. Phys. Chem. B.**2018**, 122, 12114-12130.

(5) Free-radical Sensing by Naphthalimide-based Mesoporous Silica (MCM-41) Nanoparticles: A Combined Fluorescence and Cellular Imaging Study. G. Jha, S. Roy, P. K. Sahu, S. Banerjee, N. Anoop, A. Rahaman and **M. Sarkar**, Chem. Phys. Lett., **2018,** 692, 334-332.

**Conferences and Seminars Attended**

- International Symposium on Advanced Functional Materials 2018, July, 2018, at Thiruvananthapuram, Kerala, India.
- "Science and Technology for the Future of Mankind"; and also "6th World Congress on Nano-medical Sciences–ISNSCON-2018", January 2019, at VigyanBhawan, New Delhi,India.

**Invited Talks**

- At the **"International Symposium on Advanced Functional Materials 2018**", at Thiruvananthapuram, Kerala, India.July, 2018.
- At the "**Science and Technology for the Future of Mankind"; and also "6th World Congress on Nano-medical Sciences–ISNSCON-2018" ,** January 2019, at VigyanBhawan, New Delhi,India.

**Sponsored Projects**

Understanding the photophysics of molecular(organic) aggregates .....nanoscale materials for optoelectronic applications" from SERB (On going Project)

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| **Name of the Faculty** | **Dr. Nagendra K. Sharma** |
| **Designation** | **Reader-F** |
| **Title of the Research** | Syntheses and Biochemical Evaluation of Nucleic Acid (DNA/RNA) and Amino Acid Analogues. |

**Brief introduction of updated research work**

Nucleic acids (DNA/RNA) and peptidesare biomacromolecules and involved in various biological process including the regulation of gene expressions. In recent times, these molecules are considered as potential therapeutic drug candidates. However, a fewobstacles are persist to use natural DNA/RNA/peptides as drugs. The major ones are cell permeability, serum stability, and off target effects. His research area comprises the syntheses of modified DNA, RNA and peptides analogues to overcome the major challenges in development of drugs derived from nucleic acid and peptides. For example, my group has recently exploreda new DNA and amino acid analogues bearing Tropolone scaffolds which shows many pharmaceutical properties including lipophilic nature. Most importantly tropolone exhibits excellent metal chelating and photophysicalproperties.Further the syntheses of tropolone bearing RNA analogues are in progressfor CRISPR technology with modified RNA analogues.His research group have explored the photophysical properties of tropolone for the development also new kind of BODIPY analogue, without dipyrromethene scaffold My research group are also involved in synthesis of caged RNAphosphoramidites and caged-siRNA using o-nitobenzylphotolabile protecting group for light dependent temporal control of specific gene expression using RNAitechnology.His group have also synthesized new unnatural amino acids/peptides derived from Ampyrone (analgesic drugs) and performed conformational studies in solid and solution studies.

**Publications (F.Y 2018-19)**


1. Balachandra C, Sharma N K* Direct/Reversible Amidation of TroponylAlkylglycinates via Cationic Troponyl Lactones and Mechanistic Insights, ACS Omega**2018**, 3, 997–1013
2. Gade, C. R.; Sharma, N. K.* Helical supramolecular self-assembly by prolamide thymidine/uridine analogues Supramolecular Chemistry, **2018**, 30, 965-969
3. Bollu, A. Sharma, N. K.*, Tropolone conjugated DNA: pH Induced Fluorescence Enhancement of Tropolone in DNA Duplex, ChemBioChem **2019**, 20, 1-10.
4. Bollu, A. Sharma, N. K.* Syntheses and Conformational Analysis of New Aminopyrazolonyl Amino Acid (APA)/Peptides, Eur. J. Org. Chem .**2019**, 1286-1292.
5. Bollu, A. Sharma, N. K.* Cleavable Amide Bond: Mechanistic Insight of Cleavable 4-Aminopyrazolyloxy Acetamide at low pH, J. Org. Chem. **2019**, 84, 5596–5602.

6. Mohanlal, S. Sharma, N. K.* Syntheses of β3-Aryl-Alaninyl Derivatives by sp3 C-H Activation with $Pd(OAc)_2$ Catalyst/Pivalic Acid in DCE and Their Structural Studies in Solid State, Chem. Select, **2019,** 4, 7058-7066
7. Palaia, B. B., Soren, R.; and Sharma, N. K* BODIPY Analogues: Synthesis and Photophysical studies of difluoro Boron complexes from 2-Aminotropone Scaffolds through N, O-Chelation. Org. Biomol. Chem. **2019, 17**, 6497-6505.

**Conferences and Seminars Attended**

1) As convener Organize conference NBCC-2018, NISER-Bhubaneswar.
2) Chair the sessions of NBCC-2018, NISER-Bhubaneswar

**Invited Talks**

1) UGC-National Seminar on Recent Advances on molecules of Chemical Biological Importance, Municipal College, Rourkela, Odisha, 6th -7th February 2018.
2) iConChem2018 Conference, IISER-Tirupati, Tirupati, AP, India, 24th -26th May 2018.
3) iConChem2018, IISER-Tirupati.
4) CBISNF-2019, VigayanBhanvan, New Delhi.
5) IC-CBSDD-2019, Berhampur University, Berhampur.
6) School of Applied Sciences, Kalinga Institute of Industrial Technol ogy (KIIT) –Bhubaneswar.
7) SupraBio2019, Barcelona, Spain.

**Sponsored Projects**

1) Genome Engineering Technologies with project reference BT/PR26143/GET/119/112/2017; Department of Biotechnology (DBT), Govt. Of India, New Delhi,
   **Title:** CRISPR-RNA-Cas9 System: Syntheses and Biochemical Evaluations of Nucleobase Modified tropolonyl-Ribose Nucleoside in CRISPR-RNA;
   **Duration:** 03 years;
   **Amount:** 84.0 Lakh

**Additional information, if any.**

1) He is involved teaching of most organic chemistry courses for M.Sc. and PhD. Students at NISER-Bhubaneswar.
2) Two students have received PhD degree under his supervision. Three M.Sc students have also completed their M.Sc. Research project under his supervision

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| **Name of the Faculty** | **Dr. P.C. Ravikumar** |
| **Designation** | **Reader F** |
| **Brief introduction of updated research work** | He did his Ph. D from IISC Bangalore under the guidance of Prof. A. Srikrishna in the field of total synthesis of natural products. Subsequently after completing his Ph. D he moved to Duquesne University, Pittsburgh USA in the group of Prof. Fraser Fleming as a post doctoral associate in 2007. He then moved to Yale University in the group of Prof. Seth Herzon in 2009. For a short period, he worked as adjunct faculty in Duquesne University. In 2010 he returned back to India and joined as Assistant Professor at IIT Mandi. In December 2015 he moved to NISER Bhubaneswar as Reader F. Currently he is setting up his research lab and planning to work on the area of developing new CH activation methodologies and its application to synthesisof natural product targets. |

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| **Name of the Faculty** | **Dr.Prasenjit Mal** |
| **Designation** | **Associate Professor** |
| **Title of the Research** | Weak Interactions to Control C-Hetero Bond Formation Reaction |
| **Brief introduction of updated research work** | On the way to weakening of strong chemical bonds via weak interactions (soft fore) is significant in both making new chemical systems with functions or to understand the complex functions of living systems. Mal and co-workers are involved to show several low-energy and low-level interactions or weak interactions are explored to control certain reactivity of chemical systems. They have developed various aspects of metal free C-hetero (N, O, S) bond formation reactions controlled by weak interactions. |
| **Publications (F.Y 2018-19)** | 1. M. Pramanik, K. Choudhuri and P. Mal, N-Iodosuccinimide as Bifunctional Reagent in (E)-Selective C(sp2) –H Sulfonylation of Styrenes, Asian J. Org. Chem., 2019, **8**, 144-150.<br>2. A. Parida, K. Choudhuri and P. Mal, Unsymmetrical Disulfides Synthesis via Sulfenium Ion, Chem. Asian J., 2019, 10.1002/asia.201900620.<br>3. A. Mandal, P. Swain, B. Nath, S. Sau and P. Mal, Unipolar to ambipolarsemiconductivity switching in charge transfer cocrystals of 2,7-di-tert-butylpyrene, CrystEngComm, 2019, **21**, 981-989.<br>4. A. Mandal, K. Rissanen and P. Mal, Unravelling Substitution Effects on Charge Transfer |

Characteristics in Cocrystals of Pyrene Based Donors and 3,5-Dinitrobenzoic Acid, CrystEngComm, 2019, 10.1039/C1039CE00561G.

5. S. Maiti, M. T. Alam, A. Bal and P. Mal, Nit renium Ions from Amine-Iodine(III) Combinations, Adv. Synth. Catal., 2019, 10.1002/adsc.201900441.
6. K. Choudhuri, S. Maiti and P. Mal, Iodine(III) Enabled Dehydrogenative Aryl C–S Coupling by in situ Generated Sulfenium Ion, Adv. Synth. Catal., 2019, **361**, 1092-1101.
7. A. Bose, S. Sau and P. Mal, Intramolecular C(sp3)–H Imination towards Benzimidazoles Using Tetrabutylammonium Iodide and tBuOOH, Eur. J. Org. Chem., 2019, 10.1002/ejoc.201900732.
8. A. Bose and P. Mal, Mechanochemistry of supramolecules, Beilstein J. Org. Chem., 2019, **15**, 881-900.
9. A. Bose, S. Maiti, S. Sau and P. Mal, An intramolecular C(sp3)–H imination using PhI–mCPBA, Chem. Commun., 2019, **55**, 2066-2069.
10. A. Bose, S. Maiti and P. Mal, CHAPTER 9: Soft Forces in Organic Synthesis by C–N Coupling Reactions. In Noncovalent Interactions in Catalysis, K. T. Mahmudov, M. N. Kopylovich, M. F. C. Guedes da Silva and A. J. L. Pombeiro, Eds. The Royal Society of Chemistry: 2019; pp 188-208.
11. A. Bal, S. Maiti and P. Mal, Steric and Electronic Effect on C2-H Arylation of Sulfonamides, ChemistrySelect 2019, **4**, 7010-7014.

**Conferences and Seminars Attended**

1. Title: **Supramolecular Catalysis in C-N Bond Synthesis; OMSRI-2019;** Department of Chemistry IIT RoorkeeRoorke. February 08 -10, 2019
2. Title: **Weak Interactions to Control C-N Bond Synthesis;** Interaction Meeting of Alumni and Faculties of Department of Chemistry, IIT Kharagpur-2019; May 30, 2019.

**Invited Talks**

1. Title: **Weak Interactions to Control C-Hetero Bond FormationReactions;** AtDepartment of Chemistry, NIT Meghalaya; Shillong; May 30, 2019
2. Title: **Weak Interactions to Control C-Hetero Bond FormationReactions;** AtDepartment of Chemistry, North Eastern HillUniversity; Shillong; May 31, 2019

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| **Name of the Faculty** | **Dr. S. Peruncheralathan** |
| **Designation** | **Associate Professor** |
| **Title of the Research** | Synthetic Organic Chemistry |
| **Brief introduction of updated research work** | Our research interest is selective functionalization of C –X and C–H bonds of aromatic compounds. We use catalysis as tool to achieve the selective functionalization. This is applied for synthesis of deuterated compounds, 2-aminobenzoheterocyles, indolo fused heterocycles, and natural products. We study biomedical applications of these heterocylces such as anti- angiogenesis, anti-inflammatory. |
| **Publications (F.Y 2018-19)** | 1. "Nickel Catalyzed Site Selective C –H Functionalization of α-Aryl-thioamides" D. Bandyopadhyay, A. Tirupathi, N. Dhage, N. Mohanta, and S. Peruncheralathan, Org.Biomol. Chem, 16, 6405 – 6408 (**2018**).<br>2. "Copper Catalyzed Intramolecular N-Arylation of Ketene Aminals at RoomTemperature: Synthesis of 2 -Amino-3-Cyano indoles", A. Thirupathi, M. Janni and S.Peruncheralathan, J. Org. Chem., 83, 8668 - 8678 (**2018**). |
| **Conferences and Seminars Attended** | Main-group Molecules to Materials" (MMM) during 28-31, October, 2018. |
| **Invited Talks** | 1. *Chemical & Biological Sciences in Drug Discovery -2019, (CBSDD-2019)* at Department of Chemistry, Berhampur University, Odisha, during 8-10, March 2019.<br>2. NISER Bioorganic Chemistry Conference – 2018, School of Chemical Sciences, NISER Bhubaneswar, during 22-24, December, 2018.<br>3. Department of Chemical Sciences, IISER Mohali, 22nd November, 2018 |
| **Sponsored Projects** | Catalytic, EnantioselectiveDesymmetrization of Prochiral and meso-Compounds with Quaternary Carbon Centers, DST-SERB, 2018 – 2021, (42.2Lakhs) |
| **Conferences and Seminars organized by the faculty in the School during 2018-19** | NISER Bioorganic Chemistry Conference – 2018, School of Chemical Sciences, NISER Bhubaneswar, during 22-24, December, 2018. |

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| **Name of the Faculty** | **Dr. Sanjib Kar** |
| **Designation** | **Associate Professor** |
| **Title of the Research** | Bioinorganic chemistry |
| **Brief introduction of updated research work** | Inspired by the natural photosynthetic light harvesting antenna, chemists have investigated the use of various porphyrin arrays in order to mimic nature. Porphyrin arrays are considered to be indispensable components in various energy- and electron-transfer processes, redox catalysis, and in photonic devices. Therefore, it is absolutely essential to understand the electronic communication among the porphyrin units in various porphyrin arrays. The electronic communication between the porphyrin units can be easily tuned by changing the distance, geometry and the orientations of the interacting units. Corrole, a contracted porphyrin analogue is recently gaining lot of research interest. One possible reason for choosing corrole over porphyrin is that, corrole stabilizes metals in one-unit higher oxidation state than its porphyrin analogue, and it can in principle "store" more number of electrons that the porphyrin unit. Corroles are trianionic, however retain their aromaticity fully. All these properties have led to an intense research interest in corrole chemistry. The knowledge of the redox properties and the electronic structures of these metal complexes will enrich our fundamental understanding of these intriguing classes of molecules. Additionally, these studies might provide new materials for the opto-electronic industry. The investigations of the metal-oxo species will generate important knowhow for all branches of oxidation catalysis, a process that is highly sought after in the chemical industry. If an efficient copper-based C-H oxygenation catalyst is found, this will be a big breakthrough in this field. |
| **Publications (F.Y 2018-19)** | 1. A. Garai, S. Sobottka, R. Schepper, W. Sinha, M. Bauer, B. Sarkar and **Sanjib Kar**, Chem. - Eur. J., **2018**, 24, 12613-12622. Chromium Complexes with Oxido and Corrolato Ligands: Metal-Based Redox Processes versus Ligand Non-Innocence.<br>2. Bratati Patra, Sebastian Sobottka, Sruti Mondal, Biprajit Sarkar and **Sanjib Kar**Chem. Commun.,**2018**, 54, 9945-9948. Metal coordination induced ring contraction of porphyrin derivatives.<br>3. Sajal Kumar Patra, KasturiSahu, BratatiPatra, SrutiMondal, and **SanjibKar**Eur. J. Org. Chem. **2018**, 6764–6767. An N,N′-Bridged Corrole: First Example of a $N^{21}$ ,$N^{22}$ Methylene Bridged Corrole Derivative. |

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| **Conferences and Seminars Attended** | 1) International Conference on Frontiers in Chemical Sciences (*FICS - 2018*) from 6- 8th December 2018. Venue: IIT Guwahati<br>2) National Bioorganic Chemistry Conference (NBCC) from 22nd- 24th December 2018. Venue: NISER Bhubaneswar |
| **Invited Talks** | 1) International Conference on Frontiers in Chemical Sciences (*FICS - 2018*) from 6- 8th December 2018. Venue: IIT Guwahati<br>2) National Bioorganic Chemistry Conference (NBCC) from 22nd- 24th December 2018. Venue: NISER Bhubaneswar |
| **Sponsored Projects** | High valentMetallo—Corroles: Synthesis, characterization and applications to catalysis<br>SCIENCE & ENGINEERING RESEARCH BOARD (SERB)<br>Approved. Rs. 54.00 lakhs (approximate amount)<br>(Based on the 1st letter received from funding agency) |
| **Name of the Faculty** | **Dr. Sharanappa Nembenna** |
| **Designation** | **Associate Professor** |
| **Title of the Research** | Main group Organometallics, Inorganic synthesis and Catalysis |
| **Brief introduction of updated research work** | Currently our research group focusing on conjugated bis-guanidinate supported main group molecules and their application homogenous catalysis. In particularly, we have developed aluminium and zinc based catalyst for organic transfromations.<br>Efforts are underway to develop main group based chiral catalysts for asymmetrical catalysis. |
| **Publications (F.Y 2018-19)** | Bulky guanidinate calcium and zinc complexes as catalysts for the intramolecular hydroaminationM. Kr Barman, A. Baishya, **S. Nembenna**J. Orgnomet. Chem. (Invited) **2019**,887, 40-47<br><br>Bimetallic aluminum alkyl and iodide complexes stabilized by a bulky bis-guanidinate ligand T. Peddarao A. Baishya, S.K.Hota, S.NembennaJournal of Chemical Sciences (Invited)**2018**, 130(7), 1-7 |

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| **Name of the Faculty** | **Dr. Subhadip Ghosh** |
| **Designation** | **Associate Professor** |
| **Title of the Research** | Spectroscopy of Nanomaterials |
| **Brief introduction of updated research work** | Ground State Heterogeneity along with Fluorescent Byproducts Cause the Excitation-Dependent Fluorescence and Time-Dependent Spectral Migration in Citric Acid Derived Carbon Dots.: The integrity of fluorescent carbon dot (FCD) emission deserves its highest appreciation when sample purification is performed with extreme care. Several controversial phenomena of FCD fluorescence including excitation-dependent emission, spectral migration with time, and thereby violation of the Kasha–Vavilov rule, which sparked intense debate during recent reports, disappeared when we rigorously purified the as-synthesized FCD sample. Purification was performed by first visual silica column chromatography (observing the emissions under UV illumination) and subsequently prolonged membrane dialysis. Most of the surprising phenomena of FCD fluorescence reported earlier apparently arose from ground-state spectral heterogeneity of FCD sample containing a large amount of fluorescent impurities (mostly polymeric or oligomeric in nature). Observation of our ensemble spectroscopic measurements, albeit nicely matched with recent reports based on single-particle experiments, differed largely from that of other ensemble measurements. Our results reconciled a number of long-standing controversies on FCD emission mostly by emphasizing the urgency of sample purification with more scientific rigor. |
| **Publications (F.Y 2018 - 19)** | (i) Krishna Mishra, SomnathKoley, Subhadip Ghosh* Ground State Heterogeneity along with Fluorescent Byproducts Cause the Excitation-Dependent Fluorescence and Time-Dependent Spectral Migration in Citric Acid Derived Carbon Dots. J. Phys. Chem. Lett. **2019**, 10, 335–345.<br>(ii) KiranBharadwaj, SomnathKoley, Subhra Jana, Subhadip Ghosh* Model Free Estimation of Energy Transfer Timescale in a Closely Emitting Cdse/ZnS Quantum Dot and Rhodamine 6g FRET Couple. ChemAsianJ**2018**, 13, 3296-3303.<br>(iii) ManasRanjan Panda, SomnathKoley, Krishna Mishra, and Subhadip Ghosh* Probing of Reorganization Dynamics within the Different Phases of Thermotropic Liquid Crystals. Chemistry Select **2018**, 3, 1551-1560.<br>(iv) Siddharth Singh, SomnathKoley, Krishna Mishra and Subhadip Ghosh* An Approach to a Model Free Analysis of Excited State Proton Transfer Kinetics in a Reverse Micelle. J. Phys. Chem. C **2018**, 122, 732-740. |

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| **Conferences and Seminars Attended** | a) 6th World Congress on Nanomedical Sciences, Jan 7 th –Jan 10th, 2019, Delhi (invited talk).<br>b) IMST 2018 Dec 14-Dec 16, Amity University, Kolkata (invited talk).<br>c) Vidyasagar-Satyendranath Bose National Workshop on Expanding Horizon in Physics (EHP-2k19), Jan 16-Jan 22, Midnapore, West Bengal (invited talk)<br>d) 5th International Congress on Microscopy & Spectroscopy (INTERM-2018), April 24-April 30, Oludeniz, Turkey (Invited Talk). |
| **Invited Talk s** | (a) 6th World Congress on Nanomedical Sciences, Jan 7 th – Jan 10th, 2019, Delhi (invited talk).<br>(b) IMST 2018 Dec 14-Dec 16, Amity University, Kolkata (invited talk).<br>(c) Vidyasagar-Satyendranath Bose National Workshop on Expanding Horizon in Physics (EHP-2k19), Jan 16-Jan 22, Midnapore, West Bengal (invited talk)<br>(d) 5th International Congress on Microscopy & Spectroscopy (INTERM-2018), April 24-April 30, Oludeniz, Turkey (Invited Talk). |
| **Sponsored Projects** | 1. Ultrafast and Single Molecule Spectroscopy Study of Polymers, Organometallic Compounds and Bio-Macromolecular Assemblies [2017-2020] Funded by CSIR Cost 18 lakhs<br>2. Single molecule study of polymers (mid term appraisal) Funded by DAE 2018-2023. Cost 350 lakhs |
| **Name of the Faculty** | **Dr. Sudip Barman** |
| **Designation** | **Associate Professor** |
| **Title of the Research** | Nanostructured Materials for Energy Conversion and Storage Systems |
| **Brief introduction of updated research work** | With the increase in energy demand and environmental problems due to the use of fossil fuels, there is an urgent need for alternative energy conversion and storage devices. Electrolysis of water and fuel cells are the two important renewable technologies for energy conversion and energy storage. Hydrogen is considered as one of the greenest fuels and energy carriers, but production of pure hydrogen is a challenging task. Electrocatalytic water splitting is one of the renewable ways to produce pure $H_2$. Design and synthesis of HER/HOR, ORR and OER catalysts are of crucial importance for the development o f polymer fuel cells and water electrolyzers. Our main goal is to synthesis nanostructured materials for HER, HOR, ORR and OER applications. |
| **Publications (F.Y 2018 - 19)** | 1. M. K; Bhowmik , T.; Mishra, R.; Barman, S. **ChemSusChem,2018,** 11, 2388-2408. |

2. Kundu, M. K.; Mishra, R; Bhowmik, T; Barman, S, **J. Material Chemistry A, 2018**, 6, 23531 -23541.

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| **Name of the Faculty** | **Prof. T. K. Chandrashekar** |
| **Designation** | **Sr.Professor** |
| **Title of the Research** | Expanded Core-Modified Porphyrinoids |
| **Brief introduction of updated research work** | Our research interests are: (1) synthesis of core -modified expanded porphyrinoids and demonstrated their ability to bind and transport anions and transition metal cations;(2) Photosensitizer for photodynamic therapy and model compounds for photosynthetic intermediates; (3) Structural diversity in expanded porphyrinoids: Normal, Inverted, Fused and Bridged ring systems and (4) Expanded porphyrins: Applications as third order Nonlinear Optical materials. |
| **Publications (F.Y 2018 - 19)** | 1. 24π Core-Modified NonfusedPentaphyrin with MöbiusAromaticity. Arindam Ghosh, S. Dash, A. Srinivasan, M. S. R. Sahu, C. H. Suresh and **T. K. Chandrashekar.** ***Chem. Eur. J.*** **2018**, *24*, 17997-18002.<br>2. Two non-identical Twins in one Unit Cell: Characterization of 34π aromatic core-modified octaphyrins, their structural isomers and anion bound complexes. Arindam Ghosh, Syamasrit Dash, A. Srinivasan, C. H. Suresh, **T. K. Chandrashekar.** ***Chem. Sci.*** **2019**, *10*, 5911-5919. |
| **Conferences and Seminars Attended** | 1. Main-group Molecules to Materials, IISc, Bangalore, 28th – 31st October 2018. |
| **Invited Talks** | 1. Invited talk; Title: Expanded Porphyrins: Molecules with Diverse Applications; IIT-Guwahati, 29th March 2019 |
| **Name of the Faculty** | **Dr. U Lourderaj** |
| **Designation** | **Associate Professor** |

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| **Name of the Faculty** | **Dr. Venkatasubbaiah Krishnan** |
| **Designation** | **Associate Professor** |
| **Title of the Research** | Hybrid organic-inorganic materials |
| **Brief introduction of updated research work** | The chemistry in my group will be interdisciplinary which includes inorganic, polymer and organic. My research focuses on the development of new synthetic routes for application in catalysis, and materials chemistry and fall into the following general areas viz., cooperative catalysts for $CO_2$ fixation, chiral counterions, hybridinorganic-organic materials. |
| **Publications (F.Y 2018 - 19)** | 1. K. Dhanunjayarao, S Shreenibasa, B. P. R. Aradhyula Krishnan Venkatasubbaiah*, Synthesis of phenanthroimidazole-based four coordinate organoboron compounds *Tetrahedron* **2018, 74**, 5819–5825 (Invited article).<br>2. M. Ramesh, M. S. Subramani, S. Samser, P. Biswal, Krishnan Venkatasubbaiah* Chemoselective alkylation of aminoacetophenones with alcohols by using a palladacycle-phosphine catalyst,*Eur. J. Org. Chem.* **2018**, 6286–6296<br>3. K. Dhanunjayarao, S Shreenibasa, N. Prakash, S. Joseph Ponniah, Krishnan Venkatasubbaiah*, Tetrahydrodibenzophenanthridine -Based Boron-Bridged Polycyclic Aromatic Hydrocarbons: Synthesis, Structural Diversity, and Optical Properties, *Organometallics* **2019,38,** 870–878..<br>4. R. V. R. N. Chinta, B. P. R. Aradhyula, A. C. Murali, Krishnan Venkatasubbaiah*, Synthesis, photophysical and electrochemical properties of naphthaldimine based boron complexes, *J. Organomet. Chem.***2019, 891,** 20-27.(Invited article) |
| **Invited Talks** | 1) Krishnan Venkatasubbaiah, Imidazole and Pyrazole based Hybrid Materials: Synthesis, Characterization and Applications, (Main-group molecules to materials-MMM-2018), IISc-Bangalore, October, 28-31, 2018.<br>2) Krishnan Venkatasubbaiah, Synthesis, Characterization and Applications of Hybrid Inorganic-Organic Materials (AMCI-2019), ManonmaniamSundaranar University, January, 30-31, 2019 |
| **Sponsored Projects** | Imidazole containing polymers for the selective detection of fluoride ion and synthesis of boron-complexes, (EMR/2017/000620); Sanctioned amount: Rs. 5888845, Funding Agency: SERB-DST |

## SCHOOL OF EARTH AND PLANETARY SCIENCES

### Research Activity

**Response of a coastal tropical pelagic microbial community to changed salinity and temperature**

Studies on the responses of tropical microbial communities to changing hydrographic conditions are presently poorly represented. Our mesocosm experiments, conducted jointly with Universities of Gothenburg and Kristianstad, Sweden and the College of Fisheries, Karnataka, yielded the following results. A mesocosm study was conducted in southwest (SW) coastal India to investigate how changes in temperature and salinity will affect a tropical microbial community. The onset of algal and bacterial blooms, the maximum production and biomass, and the interrelation between phytoplankton and bacteria was studied in replicated mesocosms. The treatments were set up featuring ambient control (28 °C, 35 PSU), decreased salinity (31 PSU), increased temperature (31 °C) and a double stressed treatment with increased temperature and decreased salinity (31 °C, 31 PSU). The reduced salinity treatment had the most considerable influence manifested as significantly lower primary production, and the most dissimilar phytoplankton species community. The increased temperature acted as a positive catalyst in the double manipulated treatment, and higher primary production was maintained in this treatment. We investigated the dynamics of the microbial community with a structural equation model approach, and found a significant interrelation between phytoplankton and bacterial biomass. Using thismethodology it became evident that direct and indirect effects influence the different compartments of the microbial loop. In the face of climate change, we conclude that in relatively nutrient replete environments, such as the tropical coastal zones, nutrient assimilation is dependent on salinity and temperature and will have significant effects on the quantity and the character of microbial biomass and production. This work was done in collaboration with Fisheries College, Mangalore and University of Gothenburg, Sweden.

**Wind Strength Variability in the Western Arabian Sea since the Last Glacial Maximum: Southwest vs. Northeast Monsoon Modes**

Both the southwest monsoon (SWM) and the northeast monsoon (NEM) winds are responsible for the variations in the biological productivity in the western Arabian Sea (WAS), as recorded in the Arabian Sea sedimentary planktic foraminiferal record. While earlier studies from this region ascribe the total observed variability predominantly to SWM, here we attempt to differentiate between the two monsoons based on the relative abundances of depth stratified planktic foraminifera assemblages. We observe a number of intervals of enhanced SWM. The first intensification (SWMI-I) occurred during ~16 to 12 ka and is possibly an outcome of early deglacial melting and stepwise increase in SWM strength after the end of the last glacial maximum (LGM). The second intensification (SWMI-II) is recorded at around ~10 ka, after the gradual strengthening from the end of the Younger Dryas cold episode. The last interval of intensification (SWMI -III) occurred around (~8.2 to 7.8 ka). In addition, there are two intervals of enhanced NEM: NEMI -I at

around 19 to 17 ka and NEMI-II (~8.0 to 5.4 ka). These intervals of two enhanced NEM and three SWM wind strengths are bridged by decline in the SWM at different intervals, such as SWMD -I (~17 to 16 ka), SWMD-II (~12 to 11 ka) and SWMD-III (9.7 ka to 8.2 ka). This work was done in collaboration with University of Delhi.

**SCHOOL OF MATHEMATICAL SCIENCES**

**Dr. Anil Kumar Karn, Associate Professor**

**Title of the Research: Functional Analysis**
**Brief introduction of updated research work:**

Order structure of C*-algebra: I am interested in the study of the order structure of a C*-algebra. Let us recall that the self-adjoint part of a C*-algebra may be characterized by as an abstract-M space. (An abstract-M space is a Banach lattice with some additional properties.) Further, we note that the self-adjoint part of a non-commutative C*-algebra (for example: B(H), dim(H) ≥ 2) is not a Banach lattice. However, a `non-commutative' lattice-type structure can be `seen' in the self-adjoint part of a non-commutative C*-algebra. This structure is a lattice if and only if the $C*-algebra is commutative. I am very close to find an abstract characterization of this structure. As soon as this gap is filled, a non-commutative Banach latice theory may be proposed. This programme may lead to an abstract order theoretic characterization of a non-commutative C*-algebra. Not to mention seperately that this programme uses heavily the theory of matrix ordered spaces.

**Dr. Brundaban Sahu, Associate Professor**
**Title of the Research: Number Theory**
**Brief introduction of updated research work:**

Given a fixed Hilbert modular form, we consider a family of linear maps between the spaces of Hilbert cusp forms by using the Rankin-Cohen brackets and then we compute the adjoint maps of these linear maps with respect to the Petersson scalar product. The Fourier coefficients of the Hilbert cusp forms constructed using this method involve special values of certain Dirichlet series of Rankin-Selberg type associated to Hilbert cusp forms.

We construct certain Jacobi cusp forms of several variables by computing the adjoint of linear maps constructed using Rankin-Cohen type differential operators with respect to the Petersson scalar product. We express the Fourier coefficients of the Jacobi cusp forms constructed, in terms of special values of the shifted convolution of Dirichlet series of Rankin -Selberg type. This is a generalization of an earlier work of the authors on Jacobi forms to the case of Jacobi forms of several variables.

(Convolution sums and applications) We compute con volution sums of divisor function using the theory of modular forms and quasi modular forms and apply those to find number of representations of an integer by certain quadratic forms.
We find the number of representations of integers by certain quadratic forms in $8$ variables by using the theory of modular forms. By expressing these formulas in terms of certain convolution

sums of the divisor function and using our formulas, we deduce formulas for the convolution sums $W_{j, 7}(n)$ for $j = 1,2,3,4$.

We find the number of representations of the quadratic form $x_1^2 +x_1x_2 +x_2^2 +x_3^2 +x_3x_4 +x_4^2 +\cdots+x_{2k}^2+x_{2k?1}x_{2k} +x_{2k}^2$, for $k = 7, 9, 11, 12, 14$ using the theory of modular forms. By comparing our formulas with the formulas obtai ned by G. A. Lomadze, we obtain the Fourier coefficients of certain newforms of level $3$ and weights $7, 9, 11$ in terms of certain finite sums involving the solutions of similar quadratic forms of lower variables. In the case of $24$ variables, comparison of these formulas gives rise to a new formula for the Ramanujan tau function.

**Dr. Binod Kumar Sahoo, Associate Professor**
**Title of the Research:**

- Blocking sets in finite geometry
- Power graph of finite groups

**Brief introduction of updated research work:**

- Blocking sets in finite geometry: We study blocking sets in finite projective spaces with respect to varying sets of line sets.
- Power graph of finite groups : We study vertex connectivity of the power graph of different finite groups.

**Dr. Deepak Kumar Dalai, Reader-F**
**Title of the Research:**

- Cryptanalysis of Stream ciphers
- Design and analysis of key pre -distribution scheme (KPS) for wireless sensor network(WSN)

**Brief introduction of updated research work:**

- Cryptanalysis of Stream ciphers: There are several p opular stream ciphers which are used for efficient encryption. Grain family of stream ciphers (Grain -v1, Grain 128), ACORN are very popular. We cryptanalysis these ciphers to find non -randomness using several techniques.
- Design and analysis of key predistr ibution scheme (KPS) for wireless sensor network(WSN): Design of WSN or low cost IoT are recently a very hot topic in the study of networking. Several such networking needs the communating data to be encrypted. As the nodes of such network are having low p ower, memory and processor, the symmetric key encryption is needed. As a result, a good KPS is desired. We design various KPS and analyse them.

**Dr. Jaban Meher, Reader -F**
**Title of the Research: Number Theory, Modular forms**
**Brief introduction of updated rese arch work:**

- In this year, I mainly worked on the zeros of L -functions attached to half-integral weight cusp forms. In a collaboration with S. Pujahari and K. D. Shankhadhar we have proved that the L-functions attached to certain half-integral weight modular forms have infinitely many zeros on the critical line.

**Dr. Kamal Lochan Patra, Reader-F**
**Title of the Research:**

- Centrality in connected graphs
- Power graph of finite groups

**Brief introduction of updated research work:**

- Centrality in connected graphs: We study the different middle parts of connected graphs and their relations.
- Power graph of finite groups : We study vertex connectivity of the power graph of different finite groups.

**Dr. Manas Ranjan Sahoo, Reader-F**
**Title of the Research: Partial Differential Equations**
**Brief introduction of updated research work:**

- We considered a strictly hyperbolic system of conservation laws known as Euler equation of compressible fluid flow and studied the limiting behavior of its solutions as the pressure like term vanishes.
- We studied initial value problem for the zero-pressure gas dynamics system and the associated adhesion approximation. We used adhesion approximation and modified adhesion approximation in the construction of solution. First we proved a general existenc e result for the adhesion model for bounded and $H^1$ initial data. Then we focus on the construction of explicit formula for the weak asymptotic solution and generalized solution for the plane wave initial data.
- We showed a different proof that vanishing moments of the complex sequence imply that the sequence is identically zero, provided the sequence is in $l^p$ using heat type kernels.
- We constructed approximate solutions for heat equation and obtained error estimations.
- We studied the vanishing visco sity limit and large time behavior of a non-strictly system of balance laws known as Saint Venant system for kinematic waves which models incompressible fluid flow in an open channel.

**Dr. Ritwik Mukherjee, Reader-F**
**Title of the Research: Enumerative Geometry and Gromov-Witten Invariants**
**Brief introduction of updated research work:**

I work in enumerative geometry of singular curves. I also work on moduli space of stable maps and Gromov-Witten Invariants. I use methods from differential topology and symple ctic geometry in my research.

**Dr. Shyamal Krishna De, Reader-F**
**Title of the Research: Sequential Confidence and Point Estimation of the Population Gini Index**
**Brief introduction of updated research work:**

Number of authors considered the problem of estima tion of population Gini index G as the data is collected sequentially and considered loss due to estimation as the absolute difference

between G and an estimator of G. In this work, we provide both economic persuasion and motivation behind a new formulation of the loss function due to estimation as a weighted (relative to the mean) absolute difference between G and its estimator. We treat both confidence set estimation as well as minimum risk point estimation problems for G by controlling accuracies relative to the population mean without assuming any specific distribution of the data. Optimality properties of the proposed purely sequential method under confidence set estimation include first-order asymptotic efficiency and first-order asymptotic consistency properties. Characteristics of the purely sequential method under minimum risk point estimation relative to the population mean are examined and a number of desirable asymptotic optimality properties are proved. In the second problem, the optimality properties of the proposed purely sequential method include first-order asymptotic efficiency and first-order asymptotic risk efficiency properties. Small and moderate sample size performances of the new methods are examined through extensive sets of simulation studies.

**Dr. Dinesh Kumar Keshari, Assistant Professor**
**Title of the Research: q-Commuting dilation**
**Brief introduction of updated research work:**

We prove that any pair of q-commuting contractions on a Hilbert space dilates to a pair of q-commuting unitaries, where $|q| = 1$. We generalize this result to a (G,q)-commuting n-tuple $(T_1,\ldots,T_n)$ of strict contractions, where G is an acyclic graph with vertex set $\{1, \ldots, n\}$. We further generalize it to a family of (G, q)-commuting strict contractions, where G is an acyclic graph on an infinite set of vertices.

**Dr. Nabin Kumar Jana, Assistant Professor**
**Title of the Research: Dynamics of absolute comparible elements**
**Brief introduction of updated research work:**

Let a and b be elements in the closed ball of a unital $C^*$-algebra A. The element a is absolutely compatible with b if $|a-b|+|1-a-b|=1$. Let $T:A\to B$ be a contractive linear mapping between $C^*$-algebras. We prove that T is a triple homomorphism if, and only if, T preserves absolutely compatible elements. Also we describe a complete list of absolutely compatible pairs in $M_2$. We note that non-commutative pairs exhibit an elliptic behaviour.

**Dr. K. Senthil Kumar, Assistant Professor**
**Title of the Research: Algebraic independence of values of Weierstrass's functio ns**
**Brief introduction of updated research work:**

We study the transcendence degree of the fields generated over the field of rational numbers by the values of Weiertsrass's elliptic and zeta functions. At present, we are interested to find those fields which has transcendence degree at least two over the field of rational numbers.

**Dr. Sutanu Roy, Assistant Professor**
**Title of the Research: Quantum symmetries of classical and quantum spaces**
**Brief introduction of updated research work:**

We consider the construction of twisted tensor products in the category of $C^*$-algebras equipped with orthogonal filtrations and under certain assumptions, which turns out to be the generalized Drinfeld double of the quantum symmetry groups of the original filtrations. We show how these results apply to a wide class of crossed products of $C^*$-algebras by actions of discrete groups.

We also discuss an example where the hypothesis of our main theorem is not satisfied and the quantum symmetry group is not a generalized Drinfeld double.

## Publications (F.Y 2018 -19)

**Dr. Anil Kumar Karn, Associate Professor**

- Compact factorization of operators with λ-compact adjoints, Antara Bhar and Anil Kumar Karn; Glassgow Math. J., 60(2018), no. 1, 123-134.
- Algebraic orthogonality and commuting projections in operator algebras, Anil Kumar Karn; Acta Sci. Math. (Szeged), 84 (2018), 323-353.
- $M$-ideals and split faces of the quasi state space of a non-unital ordered Banach space, Anindya Ghatak and Anil Kumar Karn; Positivity, 23(2019), 413-429. (DOI: 10.1007/s11117-018-0614-1); (https://arxiv.org/abs/1704.07628). ( https://rdcu.b e/7RZx).
- Contractive linear preservers of absolutely compatible pairs between C$^*$ -algebras, Nabin K. Jana, Anil K. Karn and Antonio M. Peralta; Revista de la Real Academia de Ciencias Exactas, Físicas y Naturales. Serie A. Matemáticas (RCSM), 113(2019) no. 3, 2731-2741. (https://arxiv.org/abs/1810.10886).DOI:10.1007/s13398 -019-00653-0 (https://rdcu.be/bogLn )
- $CM$-ideals and $L^{1}$-matricial split faces, Anindya Ghatak and Anil K. Karn; Acta Sci Math (Szeged), (2019), (accepted for publication).

**Dr. Brundaban Sahu, Associate Professor**

- Abhash Kumar Jha and Brundaban Sahu, Rankin-Cohen brackets on Jacobi forms of several variables and special values of certain Dirichlet series, accepted in International Journal Number Theory.
- B. Ramakrishnan, Brundaban Sahu and Anup Kumar Singh, on the number of representations by certain quadratic forms in 8 variables, accepted in Automorphic Forms and Related Topics , Contemporary Mathematics, American Mathematical Society.
- Abhash Kumar Jha and Brundaban Sahu, Differential operators on Jacobi forms and special values of certain Dirichlet series, Accepted in Automorphic Forms and Related Topics, Contemporary Mathematics , Vol-732, American Mathematical Society.

**Dr. Binod Kumar Sahoo, Associate Professor**

- B. De Bruyn, B. K. Sahoo and Bikramaditya Sahu, Blocking sets of tangent and external lines to a hyperbolic quadric in PG(3,q), Discrete Mathematics 341 (2018), 2820-2826.
- B. De Bruyn and B. K. Sahoo, On minimum size blocking sets of the outer tangents to a hyperbolic quadric in PG(3,q), Finite Fields and Their Applications 56 (2019), 31-57.
- B. K. Sahoo and Bikramaditya Sahu, Blocking sets of tangent and external lines to a hyperbolic quadric in PG(3,q), q even, Proceedings of the Indian Academy of Sciences: Mathematical Sciences 129 (2019), no. 1, 129:4.
- B. K. Sahoo and Bikramaditya Sahu, Blocking sets of certain line sets to a hyperbolic quadric in PG(3,q), Advances in Geometry, to appear. https://doi.org/10.1515/advgeom -2018-0009

- S. Chattopadhyay, K. L. Patra and B. K. Sahoo, Vertex connectivity of the power graph of a finite cyclic group, Discrete Applied Mathematics, to appear. https://doi.org/10.1016/j.dam.2018.06.001
- B. De Bruyn, B. K. Sahoo and Bikramaditya Sahu, Blocking sets of tangent lines to a hyperbolic quadric in PG(3,3), Discrete Applied Mathematics, to appear. https://doi.org/10.1016/j.dam.2018.12.010
- S. Chattopadhyay, K. L. Patra and B. K. Sahoo, Vertex connectivity of the power graph of a finite cyclic group II, Journal of Algebra and its Applications, to appear. https://doi.org/10.1142/S0219498820500401
- S. Chattopadhyay, K. L. Patra and B. K. Sahoo, Minimal cut-sets in the power graph of certain finite non-cyclic groups, communicated (arXiv:1802.07646v1).
- B. De Bruyn, P. Pradhan and B. K. Sahoo, Minimum size blocking sets of certain line sets with respect to an elliptic quadric in PG(3,q), communicated.
- S. Chattopadhyay, K. L. Patra and B. K. Sahoo, Laplacian eigenvalues of the zero divisor graph of the ring Z_n, communicated (arXiv:1903.07841v1).

**Dr. Deepak Kumar Dalai, Reader-F**

- An Observation of Non-randomness in the Grain Family of Stream Ciphers with Reduced Initialization Round, Lecture Notes in Computer Science, Springer, pp 1-20, vol: 11348.

**Dr. Jaban Meher, Reader-F**

- (With A. Kumar) Rankin-Cohen brackets and identities among eigenforms, Pacific Journal of Mathematics, 297 (2018), 381—403.
- (With S. Pujahari and K. D. Shankhadhar) Zeors of L-functions attached to cusp forms of half-integral weight, Proc. Amer. Math. Soc. , 147 (2019), 131—143.

**Dr. Kamal Lochan Patra, Reader-F**

- D. N. S. Desai and K. L. Patra, Maximizing distance between center, centroid and subtree core of trees, Proc. Indian Acad. Sci. (Math. Sci.), (2019), 129:7
- S. Chattopadhyay, K. L. Patra and B. K. Sahoo, Vertex connectivity of the power graph of a finite cyclic group, Discrete Applied Mathematics, to appear. https://doi.org/10.1016/j.dam.2018.06.001
- S. Chattopadhyay, K. L. Patra and B. K. Sahoo, Vertex connectivity of the power graph of a finite cyclic group II, Journal of Algebra and its Applications, to appear. https://doi.org/10.1142/S0219498820500401
- S. Chattopadhyay, K. L. Patra and B. K. Sahoo, Minimal cut-sets in the power graph of certain finite non-cyclic groups, Communicated (arXiv:1802.07646v1).
- S. Chattopadhyay, K. L. Patra and B. K. Sahoo, Laplacian eigenvalues of the zero divisor graph of the ring Z_n, Communicated (arXiv:1903.07841v1).

**Dr. Manas Ranjan Sahoo, Reader-F**

- Engu, Satyanarayana; Mohd, Ahmed; Sahoo, Manas Ranjan Asymptotic behavior of solutions to the diffusion equation. *Indian J. Pure Appl. Math.* 49 (2018), no. 4, 601–620.

- Manas Ranjan Sahoo and Abhrojyoti Sen; Limiting behaviour of some strictly hyperbolic system of conservation laws, Asymptotic Analysis, to appear.
- Manas R. Sahoo, Engu Satyanarayana and Abhrojyoti Sen, On a complex sequence of vanishing moments, Journal of Ramanujan Mathematical Society, to appear
- Abhishek Das, K.T. Joseph and Manas R. Sahoo, Adhesion approximations of the zero - pressure gas dynamics system, communicated.
- Manas Ranjan Sahoo and Abhrojyoti Sen, Vanishing viscosity limit of a non-strictly hyperbolic system of balance laws admitting delta- waves, communicated.
- Manas Ranjan Sahoo and Abhrojyoti sen, Limiting behavior of scaled general Euler equations of compressible fluid flow, commun icated.

**Dr. Ritwik Mukherjee, Reader-F**

- Enumeration of rational curves in a moving family of P^2, jointly with Anantadulal Paul and Rahul Singh. Published in Bull des Sci, Math, 2018 (Oct).

**Dr. Shyamal Krishna De, Reader-F**

- Nitis Mukhopadhyay, Shyamal K. De and Tae Yang (2019), Sequential Confidence Set and Point Estimation of the Population Gini Index by Controlling Accuracies Relative to the Population Mean, invited paper in a special edited volume on the occasion of Gini centenary, accepted.

**Dr. Dinesh Kumar Keshari, Assistant Professor**

- Dinesh Kumar Keshari and Nirupama Mallick, q-Commuting dilation, Proc. Amer. Math. Soc. 147 (2019), no. 2, 655–669.

**Dr. Nabin Kumar Jana, Assistant Professor**

- Contractive linear preservers of absolutely compatible pairs between C* algebras (2019) RACSAM, DOI: https://doi.org/ 10.1007/s13398-019-00653-0(with Anil K. Karn, Antonio M. Peralta)

**Dr. Sutanu Roy, Assistant Professor**

- Jyotishman Bhowmick, Arnab Mandal, Sutanu Roy, Adam Skalski, Quantum symmetries of the twisted tensor products of C*-algebras, Communications in Mathematical Physics 368 (2019), no. 3, 1051—1085, https://doi.org/10.1007/s00220 -018-3279-5
- Ralf Meyer and Sutanu Roy, Braided multiplicative unitaries as regular objects, Operator Alge- bras and Mathematical Physics (Tohoku University, Sendai, 2016), Advanced Studies in Pure Mathematics, vol. 80, Mathematical Society of Japan, 2019, pp. 153–178. https://arxiv.org/abs/1701.00020

## Conferences and Seminars

**Dr. Brundaban Sahu, Associate Professor**

- School on modular forms (October, 2018), KSOM, Calicut
- International Conference on Number Theory (December 10 --14, 2018), KSOM, Calicut
- International Conference on Number Theory, (March 11 --13, 2019), IISER, Thiruvananthapuram
- Zetavalue2019, (March 21--27, 2019), RIKEN, Wako, Japan

**Dr. Binod Kumar Sahoo, Associate Professor**

- International Congress of Mathematicians (August 1-9, 2018), Rio de Janeiro, Brazil.

**Dr. Jaban Meher, Reader-F**

- National seminar on recent trends in mathematical analysis and applications (28 February-1 March, 2019), Utkal University, Bhubaneswar, India.
- 16th International conference on Srinivasa Ramanujan (21-22 December, 2018), Srinivasa Ramanujan Centre, SASTRA deemed to be University, Kumbakonam, I ndia.
- Conference on Number Theory (10-14 December, 2018), Kerala School of Mathematics, Kozhikode, India.
- Workshop on Number Theory (30 November --6 December, 2018), NISER, Bhubaneswar, India.
- Workshop on Modular forms (12-14 October, 2018), Kerala School of Mathematics, Kozhikode, India.
- Building Bridges: 4th EU/US Summer School + Workshop on Automorphic forms and Related topics (9-20 July, 2018), Alfred Renyi Institute of Mathematics, Budapest, Hungary.

**Dr. Kamal Lochan Patra, Reader-F**

- 14th Annual ADMA con ference and graph theory Day, 6-10th June 2018, DA-IICT, Gandhinagar, India.

**Dr. Ritwik Mukherjee, Reader-F**

- KSOM Conference in Algebraic Geometry (in Kozhikode). Gave a talk on "Enumeration of curves with Tangencies."
- Gave a talk at Algberaic Geometry Conference at ICTS Bangalore in Oct 2018 on "Elliptic Gromov-Witten Invariants"
- Gave a series of five lectures at NCM workshop at Bhopal on Symplectic and Contact Geometry on Dec 2018. My lectures were on "Gromov -Witten Invariants and Quantum Cohomology".

**Dr. Dinesh Kumar Keshari, Assistant Professor**

- Symposium on Operator Theory, IISc Bangalore, India, February 20-22, 2019.

**Dr. Nabin Kumar Jana, Assistant Professor**

- Lectures in Probability and Stochastic Processes XIII, Indian Statistical Institute, Bangalo re, Dec 07 - 11, 2018

**Dr. K. Senthil Kumar, Assistant Professor**

- Conference: Diophantine Geometry, May 21-25, 2018, CIRM, Luminy, Marseille, France
- Conference on Number Theory, KSOM, Dec 10 -14, 2018
- Conference on Algebra and Number Theory, Central Universit y of Tamil Nadu, Thiruvarur, Dec 16-17, 2018.

**Dr. Sutanu Roy, Assistant Professor**

- Noncommutative Geometry: Physical and Mathematical Aspects of Quantum Space- Time and Matter", SNBNCBS, Kolkata, India, November, 2018

- 18th Workshop: Noncommutative Probabili ty, Operator Algebras, Random Matrices and Related Topics, with Applications, Będlewo, Poland, July, 2018.
- Operator Theory and Operator Algebras 2018 (OTOA 2018), Indian Statistical Institute Bangalore, India, December, 2018.
- 2nd Inter IISER-NISER Math Meet 2018 (Analysis session), IISER Bhopal, India.Poland, July, 2018.

## Invited Talks

**Dr. Brundaban Sahu, Associate Professor**

- Rankin-Cohen brackets on modular forms and certain Dirichlet series" (July 11, 2019), MUIC, Bangkok.
- Rankin-Cohen brackets on Jacobi forms of several variables and special values of certain Dirichlet series" Construction of Jacobi cusp forms, School on modular forms (October, 2018), KSOM, Calicut
- Rankin-Cohen brackets on Hilbert modular forms of several variables and special values of certain Dirichlet series", International Conference on Number Theory (December 10 --14, 2018), KSOM, Calicut
- Rankin-Cohen brackets on modular forms and special values of certain Dirichlet series ", International Conference on Number Theory, (March 11--13, 2019), IISER, Thiruvananthapuram
- Rankin-Cohen brackets on modular forms and special values of certain Dirichlet series", Zetavalue2019, (March 21--27, 2019), RIKEN, Wako, Japan.

**Dr. Binod Kumar Sahoo, Associate Professor**

- Blocking sets of tangent and external lines to a hyperbolic quadric in PG (3,q), International Congress of Mathematicians (August 1-9, 2018), Rio de Janeiro, Brazil.
- Delivered six lectures at the Interactive Mathematics Training Camp (May 14 -26, 2018), at Institute of Mathematics and Applications, Bhubaneswar.

**Dr. Jaban Meher, Reader-F**

- Distribution of the signs of the Fourier coefficients of certain modular forms , National seminar on recent trends in mathematical analysis and applications, Utkal University, Bhubaneswar, India, (28 February -1 March, 2019)
- Certain identities among eigenforms, 16th International conference on Srinivasa Ramanujan, Srinivasa Ramanujan Centre, SASTRA deemed to be University, Kumbakonam, India, (21-22 December, 2018).
- Certain identities among eigenforms, Conference on Number Theory, Kerala School of Mathematics, Kozhikode, India, (10--14 December, 2018).
- On the coefficients of symmetric power L -functions, Workshop on Modular forms, Kerala School of Mathematics, Kozhikode, India, (12--14 October, 2018).
- Certain identities among eigenforms, Building Bridges: 4th EU/US Workshop on Automorphic forms and Related topics, Alfred Renyi Institute of Mathematics, Budapest, Hungary (14-20 July, 2018).

**Dr. Kamal Lochan Patra, Reader-F**

- Centrality in trees, 14th Annual ADMA confere nce and graph theory day, 6-10th June 2018, DA-IICT, Gandhinagar, India.

**Dr. Shyamal Krishna De, Reader-F**

- Invited seminar Talk: Fixed and Bounded Width Interval Estimation of the Common Correlation in an Equi-Correlated Multivariate Normal Distribution, Statistics and Mathematics Unit, Indian Statistical Institute, Kolkata, February 2019.

**Dr. Dinesh Kumar Keshari, Assistant Professor**

- Unitary and Similarity invariants of a subclass of Cowen-Douglas class of operators, Symposium on Operator Theory, IISc Bangalore, India, February 20, 2019.

**Dr. K. Senthil Kumar, Assistant Professor**

- Algebraic independence of the values of Weierstrass's functions, KSOM, Dec 10 -14, 2018.
- On transcendental numbers, Central university of Tamil Nadu, Thiruvarur, Dec 16-17, 2018.

**Dr. Sutanu Roy, Assistant Professor**

**In conferences:**

- Braided quantum E(2) groups in Recent Advances in Operator Theory and Operator Algebras 2018 (OTOA 2018), Indian Statistical Institute Bangalore, India, December 14, 2018.
- Braided compact quantum groups in 2nd Inter IISER-NISER Math Meet 2018 (Analysis session), IISER Bhopal, India.Poland, July 7, 2018.

**In Seminars:**

- Quantum plane and duality, Department of Mathematics, Indian Institute of Technology Bombay, India, February 22.
- Symmetries and Quantum Groups, Center for Theoretical Studies, Indian Institute of Technology Kharagpur, India, November 26, 2018
- From CCR to quantum groups, Center for Theoretical Studies, Indian Institute of Technology Kharagpur, India, August 24, 2018
- Semidirect product of groups and beyond, Department of Mathematics, Indian Institute of Technology Guwahati, India, May 23, 2018

## Sponsored Projects

**Dr. Binod Kumar Sahoo , Associate Professor**

- Title: Blocking sets of external, secant and tangent lines with respect to a quadric in PG(d,q)
  Funding Agency: SERB, DST, Govt. of India
  Project No.: MTR/2017/000372
  Amount: Rs. 6,60,000/-
  Duration: 2018-2021

**Dr. Jaban Meher, Reader-F**

- Identities among eigenforms and zeros of certain L-functions (MTR/2017/000022), Funding Agency: Department of Science and Technology, Govt. of India, Duration: 2018-2021.

**Dr. Manas Ranjan Sahoo, Reader-F**

- Inspire Faculty award by Department of Science and technology (DST), India ongoing from 2015.
- MATRICS by Science and Engineering Research Board (SERB), Department of Science and Technology (DST), India. Ongoing from February 2019.

**Dr. Shyamal Krishna De, Reader-F**

- Mathematical Research Impact Centric Support (MATRICS), awarded by the Science and Engineering Research Board (SERB), Govt. of India, 2018 – 2020

**Dr. Sutanu Roy, Assistant Professor**

- Inspire faculty award by Department of Department of Science and Technology (DST), India ongoing from 2016 (Session-I).
- Early Career Research Award (ECRA) by Science and Engineering Research Board (SERB), Department of Department of Science and Technology (DST), India ongoing from 2017.

## Conferences and Seminars organized by the faculty in the School during 2018 -19

**Dr. Brundaban Sahu , Associate Professor**

- Co-organized "Workshop on Number Theory (November 30 --December 6, 2018)", NISER, Bhubaneswar

**Dr. Jaban Meher, Reader-F**

- Workshop on Number Theory (30 November --6 December, 2018), NISER, Bhubaneswar, India (coorganized with B. Sahu and K. Senthil Kumar).

**Dr. Kamal Lochan Patra, Reader-F**

- Summer outreach program in Mathematics(SOPM) , 18-30 June 2018

**Dr. Nabin Kumar Jana, Assistant Professor**

- Advanced Intrustional School on Stochastic Processes funded by IASc, Bengalore and NCM, Mumbai, June 25 – July 21, 2018.

**Dr. K. Senthil Kumar, Assistant Professor**

- Workshop on Number Theory: November 30 – Dec 06, 2018 (Co-organished with Dr. Brundaban Sahoo and Dr. Jaban Mehar)

**Dr. Sutanu Roy, Assistant Professor**

- Regional Workshop on Research and Opportunities , Indian Women and Mathematics (IWM) during October 27 to 28, 2018 at NISER Bhubaneswar (Local Organiser).

**Additional information, if any.**

**Dr. Brundaban Sahu, Associate Professor**

- Ms. Moni Kumari submitted Phd thesis entitled "Rankin-Cohen type operators and some properties of Fourier coefficients of modular forms" in July 2018 and defended in December 2018.

**Dr. Ritwik Mukherjee, Reader-F**

- Currently supervising two PhD students Anantadulal Paul and Nilkantha Das; they are both currently in their fourth year. They both have one accepted paper. Anantadulal's paper is published in "Bull des Sci Math" (jointly with me and Rahul Singh). Nilkantha Das's paper is accepted in "Gokova Jour of Geometry and Topology" jointly with Chitrabhanu Chaudhri. The titel of their paper is "Elliptic Gromov-Witten Invarinats of Del-Pezzo surfaces."
- I have supervised one postdoc, Rahul Singh. He will be joining TIFR Mumbai from September 2019 as a postdoc.
- I have supervised three masters' project students.

  Gaurish Korpal on "Sheaf Theoretic De-Rham Isomorphism". He got the best masters Thesis award. He will join Arizona University as a Mathematics PhD student. He also got offers from SUNY Binghampton (PhD) and Western Ontario (Masters).
  Yashasvi Aulak on "Supersymmetry and Morse Theory". This was jointly supervised by Chethan Gowdhigree of NISER School of Physics. Yashasvi will join City University of New York as a Mathematics PhD student. He also got offers from SUNY Buffalo, Central Michigan University, University of Hawaii (PhD) and Western Ontario (Masters), all in Mathematics. Yashasvi Aulak is a Physics student of NISER, who has decided to pursue a PhD in mathematics.
  Swaroop Hegde (Fourth Year student) on "A Fourier Analytic Proof of Roth's Theorem". Swaroop is currently in his fifth year at NISER.

**Dr. Dinesh Kumar Keshari, Assistant Professor**

- Visited Hebei Normal University, Shijiazhuang, Hebei, China from December 8, 2018 to January 6, 2019.

**Dr. K. Senthil Kumar, Assistant Professor**

- Convener, PGCS, SMS
- Convener, PGCI, NISER

**Departmental Seminars:**

1) Speaker: Sagnik Sen
   Affiliation: Rama Krishna Mission Vivekananda University
   Title: Graph homorphisms and colorings
2) Speaker: Kaushik Majumder
   Affiliation: ISI Kolkata
   Title: Problems and Results in uniform intersecting families.
3) Speaker: Mr. Bikramaditya Sahu
   Affiliation: SMS, NISER
   Title: Blocking sets of certain line sets in PG (3,q)

4) Speaker: Professor Jugal K. Ver ma
Affiliation: IIT Bombay
Title: Counting roots of polynomials using volumes of Newton polytopes
5) Speaker: Tulasi Ram Reddy
Affiliation: NYU, Abu Dhabi
Title: Zeros of random polynomials
6) Speaker: Andrey Krutov
Affiliation: Independent University of Moscow
Title: Introduction to the geometry of partial differential equations
7) Speaker: Jyotishman Bhowmick
Affiliation: ISI Kolkata
Title: On the notions of connections and curvature in noncommutative geometry
8) Speaker: Pradipta Bandyopadhyaya
Affiliation: Indian Statistical Institute, Kolkata
Title: On Lindenstrauss spaces
9) Speaker: Ramprasad Kale
Affiliation: SMS, NISER
Title: Sequential Hypothesis Testing
10) Speaker: Anindya Ghatak
Affiliation: SMS, NISER
Title: p-order ideals
11) Speaker: Dr. Mrinal Kanti Das
Affiliation: ISI Kolkata
Title: On a conjecture of Murthy
12) Speaker: Andrey Krutov
Affiliation: Independent University of Moscow
Title: Jet Spaces
13) Speaker: Karen Strung
Affiliation: Radboud University - Radboud University
Title: C*-algebras, Dynamical Systems, and Classification
14) Speaker: Ms. Moni Kumari
Affiliation: SMS, NISER
Title: Rankin-Cohen type operators and some properties of Fourier coefficients of modular forms
15) Speaker: Karen Strung
Affiliation: Radboud University - Radboud University
Title: C*-algebras, Dynamical Systems, and Classification
16) Speaker: Andrey Krutov
Affiliation: Independent University of Moscow
Title: Infinite jet spaces
17) Venue: SMS Seminar Room
Speaker: Professor M. Manickam
Affiliation: KSOM, Calicut

18) Speaker: Nilkantha Das
Affiliation: SMS, NISER
Title: Counting nodal curves with prescribed tangencies
19) Speaker: Rajat Subhra Hazra
Affiliation: Indian Statistical Institute, Kolkata
Title: Mathematical Background of Random Graphs
20) Speaker: Atibur Rahaman
Affiliation: SMS, NISER
Title: Contraction procedure and braided quantum groups
21) Speaker: Abhrojyoti Sen
Affiliation: SMS, NISER
Title: LIMITING BEHAVIOR OF SOLUTIONS FOR SOME STRICTLY HYPERBOLIC SYSTEMS OF CONSERVATION LAWS
22) Speaker: Ramesh Prasad Panda
Affiliation : IIT Guwahati
Title: Connectedness and spectral properties of power graphs of finite groups
23) Speaker: Nabin Kumar Meher
Affiliation: HRI Allahabad
Title: Borel conjecture on normal number
24) Speaker: Sabyasachi Dey
Affiliation: IIT Madras
Title: Some results on Stream Ciphers
25) Speaker: Dr. Shalini Bhattacharya
Affiliation: Max Planck Institute for Mathematics, Bonn
Title: On the reduction of Galois representations and local constancy with respect to weight
26) Speaker: Santu Pal
Affiliation: SMS, NISER
Title: A Conditional Differential Cryptanalysis on the Stream Cipher Grain -v1
27) Speaker: Amit Kumar
Affiliation: SMS, NISER
Title: Projections in ordered vector spaces
28) Speaker: Sudeshna Basu
Affiliation: George Washington University, USA
Title: Linear Hahn Banach Extension of module homomorphisms in Hilbert and Banach modules
29) Speaker: Saswata Adhikari
Affiliation: SMS, NISER
Title: Hardy and Sobolev type inequalities associated with Grushin and Dunkl operators
30) Speaker: Rahul Kumar Singh
Affiliation: SMS, NISER
Title: Counting of rational planar curves in $ \mathbb{P}^3 $
31) Speaker: Atibur Rahaman
Affiliation: SMS, NISER
Title: Braided quantum E(2) groups

32) Speaker: Prof. Subrata Kundu
Affiliation: Dept. of Statistics, George Washington University
Title: Some Aspects of Modeling Software Reliability
33) Speaker: Shreedevi K. Masuti
Affiliation: Chennai Mathematical Institute
Title: Hilbert functions of Gorenstein K-algebras
34) Speaker: Jitendra Prakash
Affiliation: Waterloo University USA
Title: Entanglement breaking rank
35) Speaker: Pradeep Kumar Rai
Affiliation: IIT Patna
Title: Schur multiplier of some special p-groups
36) Speaker: Jaydeb Sarkar
Affiliation: ISI Bangalore
Title: Isometries on Hilbert spaces
37) Speaker: Satish Pandey
Affiliation: Waterloo University, USA
Title: Symmetrically-Normed Ideals and Characterizations of Absolutely Norming Operators
38) Speaker: Prof. Debashis Mondal
Affiliation: Oregon State University
Title: Introduction to spatial statistics
39) Speaker: Debraj Das
Affiliation: University of Wisconsin-Madison
Title: Perturbation Bootstrap in Adaptive Lasso
40) Speaker: Prof. Debashis Mondal
Affiliation: Oregon State University
Title: Markov random fields and geostatistics
41) Speaker: Prof. Debashis Mondal
Affiliation: Oregon State University
Title: H-likelihood methods in spatial statistics
42) Speaker: Prof. Debashis Mondal
Affiliation: Oregon State University
Title: Applications in disease mapping and environmental statistics
43) Speaker: Anindya Ghatak
Affiliation: SMS, NISER
Title: Quantization of $A_0(K)$-spaces and $M$-ideals in matrix ordered spaces
44) Speaker: Shiv Parsad
Affiliation: IISER Bhopal
Title: Hyperbolic structures, Surface symmetries, and other stories
45) Speaker: Kunal Krishna Mukherjee
Affiliation: IIT Madras
Title: Some recent results on non commutative dynamics

46) Speaker: Bidyut Sanki
Affiliation: IMSc, Chennai
Title: Graphs of systoles on hyperbolic surfaces
47) Speaker: Professor Olivier Ramare
Affiliation: CNRS / Institut de Mathématiques de Marseille
Title: Emergence and Relevance of Bilinear Form Decomposition
48) Speaker: Parameswaran Shankaran
Affiliation: IMSc Chennai
Title: The geometry of the upper half-space
49) Speaker: Dr. Mukesh Kumar Nagar
Affiliation: IIT Dharwad
Title: Immanants of Laplacians of Trees
50) Speaker: Ashutosh Nanda
Affiliation: SMS, NISER
Title: Cryptographical Significant Boolean function
51) Speaker: Mr. Diptesh Kumar Saha
Affiliation: SMS, NISER
Title: Tomita Takesaki Theory
52) Speaker: Moni Kumari
Affiliation: TIFR, Mumbai
Title: TBA
53) Speaker: Professor S. D. Adhikari
Affiliation: RKMVU, Belur
Title: Some algebraic methods in zero-sum problems
54) Speaker: Divya Khurana
Affiliation: Weizmann Institute, Israel
Title: Greedy Approximations
55) Speaker: Mr. Bikramaditya Sahu
Affiliation: SMS, NISER
Title: Blocking sets of certain line sets in PG (3, q)
56) Speaker: Prof. N. S. N. Sastry
Affiliation: IIT Dharwad
Title: Finite Simple Groups
57) Speaker: Mr. Puspendu Pradhan
Affiliation: SMS, NISER
Title: Blocking sets of certain line sets to an elliptic quadric in PG (3, q)
58) Speaker: Dr. Kamalakshya Mahatab
Affiliation: NTNU, Norway
Title: Large Values of Hardy's Z-Function
59) Speaker: Madhav Reddy Bagannagari
Affiliation: ISI Kolkata
Title: Free-type rigid C*-tensor categories and their annular representations
60) Speaker: G. Priyanga
Affiliation: Texas A & M University, USA
Title: Factorization of Identity map through large diagonal operators

61) Speaker: Kalyan Bidhan Sinha
Affiliation: JNCASR, Bangalore
Title: A Brief History of Quantum Mechanics
62) Speaker: Kalyan Bidhan Sinha
Affiliation: JNCASR, Bangalore
Title: Introduction to unbounded operators
63) Speaker: Dr. Soumya Bhattacharya
Affiliation: IISER, Kolkata
Title: Finiteness results on a certain class of modular forms and applications
64) Speaker: Balesh Kumar
Affiliation: IMSc, Chennai
Title: On Doi-Naganuma and Shimura liftings
65) Speaker: Dr. Pervez Sarwar
Affiliation: ISI Kolkata
Title: Algebraic K-theory and homology stability
66) Speaker: Dr. Varun Thakre
Affiliation: International Centre for Theoretical Sciences (ICTS -TIFR), Bengaluru (India)
Title: Generalised Seiberg-Witten equations and de-generate metrics
67) Speaker: Sauvik Mukherjee
Affiliation: Presidency University, Kolkata,
Title: Poisson Structures on Closed Manifolds
68) Speaker: Professor Probal Chaudhury
Affiliat ion: ISI Kolkata
Title: Optimization by Monte Carlo
69) Speaker: Dr. Swarup Panda
Affiliation: IIISER Kolkata
Title: Inverses of graphs and reciprocal eigenvalue properties
70) Speaker: Dr. Krishanu Dan
Affiliation: CMI, Chennai
Title: Secant Bundles on Symmetric Power of Curves.
71) Speaker: N. Balasubramani
Title: A Study on Fractal Interpolation in Shape Preserving and in Numerical Methods for Ordinary Differential Equations
72) Speaker: Professor B V Rao
Affiliation: CMI, Chennai
Title: Brownian Motion - Feynman's view
73) Speaker: Pofessor B V Rao
Affiliation: Chennai Mathematical Institute
Title: BROWNIAN MOTION
74) Speaker: Biplab Paul
Affiliation: IIT Guwahati
Title: Some variations of EM algorithms for estimating parameters of singular Bivariate Marshall-Olkin Pareto distribution

75) Speaker: Anish Ghosh
Affiliation: TIFR Mumbai
Title: Effectivity in arithmetic and dynamics
76) Speaker: Anish Ghosh
Affiliation: TIFR Mumbai
Title: Effectivity in arithmetic and dynamics
77) Speaker: Anish Ghosh
Affiliation: TIFR Mumbai
Title: An introduction to equidistribution

**SCHOOL OF COMPUTER SCIENCES**

**Dr. Rishiraj Bhattacharyya, Reader F**
**Title of the Research: Theoretical Cryptography**
**Brief introduction of updated research work:**

- In the last year we considered cryptanalysis thro ugh conditional sampling. We developed new algorithms that can test different properties of a probability distribution by making polylogarithmic (of the domain size) many conditional samples. Our result solves an open problem raised By Canonne et al. (SiComp 2015)

**Dr .Aritra Banik, Assistant Professor**
**Title of the Research: Tracking Paths**
**Brief introduction of updated research work:**

- Consider a secure environment (say an airport) that has a unique entry and a unique exit point with multiple inter-crossing paths between them. We want to place (minimum number of) trackers (or checkpoints) at some specific intersections so that based on the sequence of trackers a person has encountered, we can identify the exact path traversed by the person. Motivated by such ap plications, recently Banik et. al. have considered the Tracking Paths problem which can be defined as follows. Given an undirected graph with a source s, a destination t, and a non-negative integer k, the goal is to find a set of at most k vertices, a tracking set that intersects each s-t path in a unique sequence. Such a set enables a central controller to track all the paths from s to t. In this talk, we will discuss the known results about the problem and some related open problems.

**Dr. Subhankar Mishra, Assistant Professor**
**Title of the Research: Data Science for Environmental Issues**
**Brief introduction of updated research work:**

- **Indian Population**

  The unstoppable momentum of the Indian population is rapidly consuming India's as well as Earth's life support system. Hence the faint but a start for calls of aggressive family planning in India. The increase in standard of living of 1.3 billion Indians will expand the threat to the environment regardless the trends in per capita consumption rates because of growing aggregate and accumulated demands. Scenario based matrix modelling is used to project Indian population as well the food security to the year 2100 to examine the effects of various population reductions.

- **Climate Change vs Agriculture**
  Use of supervised Machine Learning algorithms to predict impact of climate on agriculture in India. Modelling systems take use of granular data sets developed and shared by Indian Govt. to predict the impact and provide mitigation measures against climate change and air pollution with geospatial relationships.

**Dr. Sabyasachi Karati, Assistant Professor**
**Title of the Research: Kummer Line in Binary Field**
**Brief introduction of updated research work:**

- This is a complementary work titled as "Kummer for Genus One Over Prime-Order Fields" to achive fast Diffie-Hellman Key Exchange protocol in Genus one in Binary Field. As the underlying field changed, the arithmatic of the Kummer Variety also changes and also the associated Elliptic Curve. The present updates in this work is that w e have been able to find Kummer Line in the Binary field where associated Kummer Line provides 128-bit security. We also able to theoretically able to parallelize the arithmetic of the Kummer Line.

**Dr. Manoj Mishra, Assistant Professor**
**Title of the Research: Information Theory**

**Dr. Sushmita Gupta, Assistant Professor**
**Title of the Research: Parameterized Complexity**

## Publications

**Dr. Rishiraj Bhattacharyya, Reader F**

- Property testing of joint distributions using conditional samples (with S. Chakraborty) ACM Transaction on Computation Theory (2018)
- Mmeory-tight reduction of Key Encapsulation Mechanism, preprint.

**Dr. Aritra Banik, Assistant Professor**
**Journal Publications**

- A. Banik, F. Panolan, V. Raman, V. Sahlot, S. Saurabh, Parameterized Complexity of Geometric Covering Problems Having Conflicts, Algorithmica(Accepted), 2019
- A. Banik, P. Choudhary, D. Lokshtanov, V. Raman, and S. Saurabh, Polynomial Sized Kernel for Tracking Paths Problem, Algorithmica(Accepted), 2019
- A. Banik. P. Choudhary, D. Lokshtanov, V. Raman, and S. Saurabh, Polynomial Sized Kernel for Tracking Paths Problem, Algorithmica(Accepted), 2019
- A. Banik, S. Das, A. Maheshwari, M. Smid, The Discrete Voronoi Game in a Simple Polygon, Theoretical Computer Science(Accepted), 2019
- A. Banik, B. B. Bhattacharya, S. Das, S. Das, The 1-Dimensional Discrete Voronoi Game, Operations Research Letters(accepted), 2019

## Conference Publications

- A. Banik, B. B. Bhattacharya, S. Bhore, L. Martınez-Sandoval, Geometric Systems of Unbiased Representatives, Canadian Conference on Computational Geometry 2019.

- A. Banik, A. Jacob, V. K. Paliwal and V. Raman, Fixed -parameter tractability of (n-k) List Coloring, 30th International Workshop on Combinatorial Algorithms (IWOCA)(accepted), 2019

**Dr. Subhankar Mishra, Assistant Professor**

- S.Mishra, Impact of climate change and air pollution on agriculture in India, 3rd Agriculture and Climate Change Conference, March 2019, Budapest Hungary (Accepted)
- S.Mishra, Computational Thinking for Students and Educators. 9th National Teache rs Congress, Dec 2018, Ahmedabad, Gujurat
- S.Mishra, India: Is population reduction solution for Food Security and Environmental Issues?, 3rd International Conference on Global Food Security. 2018

**Dr. Sabyasachi Karati, Assistant Professor**

- **S. Karati** and P. Sarkar, *Kummer for Genus One over Prime-Order Fields*, Journal of Cryptology, DOI: https://doi.org/10.1007/s00145 -019-09320-4 .
- **S. Karati** and P. Sarkar, *Connecting Legendre with Kummer and Edwards* , Journal of Advances in Mathematics of Communications, AIMS, Volume 13, Issue 1, 2019, pp 41-66, 2019.
- **S. Karati,** and R. Safavi-Naini, *K2SN-MSS: An Efficient Post -Quantum Signature*, The 14th ACM ASIA Conference on Computer and Communications Security - ACM ASIACCS 2019, Jul 7-12, 2019, Auckland, New Zeland, To App ear.

## Awards and Honours

**Dr. Subhankar Mishra, Assistant Professor**

- DST-BRICS Young Scientist 2018

## Conferences and Seminars

**Dr. Rishiraj Bhattacharyya, Reader F**

- Asian Symmetric Key Conference (invitation only), November 2018, Kolkata.

**Dr. Subhankar Mishra, Assistant Professor**

- 3rd Agriculture and Climate Change Conference, March 2019, Budapest Hungary
- 3rd International Conference on Global Food Security. 2018

## Invited Talks

**Dr. Rishiraj Bhattacharyya, Reader F**

- Local Decoding against Computationally bounded channel, IIT Kharagpur. March 2019.

**Dr. Aritra Banik, Assistant Professor**

- Summer School on Graph Theory and Graph Algorithm at NIT Calicut
- Ben-Gurion University of the Negev

**Dr. Subhankar Mishra, Assistant Professor**

- Introduction to Cyber Security - NITTTR, Kolkata (February 2019)

- Teaching Pedagogy On Programming Language - GIFT - Bhubaneswar (December 2018)
- Smart Healthcare - Security and Privacy KIIT, School of Computer Engineering - Bhubaneswar (December 2018)
- ICT and Privacy – DST BRICS Young Scientist s Forum – NIAS, Bangalore (December 2018)
- Digital Trust Dialogues – SheThePeople and Google (October 2018)
- Next Generation Internet Protocols - IIREF, CDAC, Mumbai (September 2018)
- Research Methodology - Utkal University (August 2018)
- Edge Computing – DAV Pokhariput (July 2018)
- Smart Grid - Socialisation, Security and Future - BRICS Young Scientist Conclave, Durban, SA (June, 2018)

## Sponsored Projects

**Dr. Rishiraj Bhattacharyya, Reader F**

- Property testing of dictributions using conditional samples. SERB Ea rly Career project.

**Dr. Aritra Banik, Assistant Professor**

- Design of Efficient Algorithms for Multiple Choice Resource Allocation Problems sponsored by SERB

**Conferences and Seminars organized by the faculty in the School during 2018 -19**
**Dr. Aritra Banik, As sistant Professor**

- Recent Trends in Algorithms February 7 -10, 2019
- ACM Summer School on Geometric Algorithms and their Applications 3 - 15 June , 2019

**Dr. Subhankar Mishra, Assistant Professor**

- 2018 Workshop on Cyber Security – June 14-18
  Awareness Program on Internet Protocols and Standards, Jan 2019 (along with CDAC Bangalore)

## SCHOOL OF PHYSICAL SCIENCES

**Brief of Research Activity**

**Prof. Sudhakar Panda, Senior Professor, Director**

(a) A generalized scalar thermal operator representation in real time formalism has been constructed.
(b) Aspects of quantum entanglement in de Sitter space has been investigated in the context of string theory

**Prof. Bedangadas Mohanty: Professor**

Experimental High Energy Physics and Dark Matter Group

## ALICE

The main physics goal of A La rge Ion Collider Experiment (ALICE) at the Large Hadron Collider (LHC) is the study of strongly interacting matter at extreme conditions of temperature and energy densities, where a deconfined phase of QCD matter called quark-glon plasma (QGP) forms. We at NISER are mainly involved in various measurements related to hadronic resonances like $K^{*0}$ and $\phi$ in pp, p-Pb, Pb-Pb and Xe-Xe collisions. $K^{*0}$ and $\phi$ are spin 1 resonance particles having lifetime ~4 fm/c and ~46 fm/c respectively. They can be used to probe both the initial and final state of the evolution of heavy-ion collisions due to their spin and lifetime, respectively.

In non-central heavy-ion collisions a large initial angular momentum is expected to create. In presence of large initial angular momentum, vector mesons (spin=1) can be polarizaed due to spin-orbital angular momentum interaction or they can be polarized during the hadronization process from polarized quarks. In experiment this phenomenon can be studied by measuring the angular distribution of the decay daughters of vector meson with respect to a quantization axis in the rest frame of vector meson. This quantization axis can be the normal to the production plane (defined by the momentum of vector meson and the beam axis) or normal to the re action plane (defined by the impact parameter and the beam axis) of the system. The study of the angular distribution leads to the estimation of the spin density matrix element $\rho_{00}$. A significant deviation of the value of $\rho_{00}$ from 1/3, which causes a non-uniform angular distribution, would indicate the presence of spin alignment. We have observed the first presence of spin -alignment of vector mesons in heavy-ion collisions at Large Hadron Collider (LHC). The measurements have been carried out for $K^{*0}$ and $\phi$ vector mesons using the ALICE detector, at mid-rapidity ($|y| < 0.5$) as a function of transverse momentum and collision centrality in Pb-Pb collisions at centre of mass energy of 2.76 TeV. The $\rho_{00}$ values are observed to be lower than 1/3 ($\rho_{00}$=1/3 corresponds to no spin alignment) at low transverse momentum for both the vector mesons and the deviations are maximum for mid-central collisions at a level of 3$\sigma$. The $\rho_{00}$ values are consistent with 1/3 for pp collisions and $K^0_S$ meson which has zero spin. The results confirm the presence of large angular momentum in heavy-ion collisions and subsequent polarization of quarks. It also supports the picture of hadronization through recombination at low trans verse momentum. Our group is solely involved in the spin alignment study of vector meson at LHC energies. Results are already approved by the ALICE collaboration and presented in several international and national conferences.

In addition to the polarization study of $K^{*0}$ and $\phi$ resonances, they can also be used to study the hadronic phase created in heavy-ion collisions. In fact, in central Pb-Pb and Xe-Xe collisions, where the lifetime of the hadronic phase is comparable to the lifetime of short lived res onances like $K^{*0}$, regeneration and rescattering effects become important. Observed $K^{*0}$ yield can be modified due to the rescattering and regeneration of $K^{*0}$ decay daughters in hadronic medium. However $\phi$ mesonyield would remain unaffected as the lifetime of $\phi$ meson is larger compared to the lifetime of hadronic phase. Recently at LHC energies we have observed striking similarities between heavy-ion collisions and small system like pp and p-Pb collisions where traditionaly we do not expect any formation of QGP. Measurements of resonance yield and their modification as a function of $\langle dN_{ch}/d\eta \rangle$ in small system can shed light on the possible presence of hadronic phase in small system like pp or p-Pb.Our group is deeply involved in the measurements of $K^{*0}$

and $\phi$ yield in heavy-ion collisions like Pb-Pb and Xe-Xe, as well as in small system like pp and p-Pb. We have measured particle yield, mean transverse momentum, resonance to stable particle ratio and nuclear modification factor. We have observed a decreasing trend in $K^{*0}/K$ ratio as a function of produced charge particle multiplicity in both heavy-ion collisions and high multiplicity small system (pp and p-Pb collisions). Whereas $\phi/K$ ratio remains flat through out the all collision systems across all multiplicities. These results confirm the presence of hadronic phase and dominance of rescattering effect over regenaration effect in heavy -ion collisions and probably also in the collisions of small systems. Results are compared with previous ALICE measurements and model calculations to understand the particle production mechanism and dynamics of the system. Results related to $K^{*0}$ and $\phi$ production in Pb-Pb collisions at 5.02 TeV, Xe-Xe collisions at 5.44 TeV, p -Pb collisions at 8.02 TeV and in pp collisions 13 TeV are already approved by the ALICE collaboration. Four paper drafts related to $K^{*0}$ and $\phi$ production in Pb-Pb and pp collisions at 5.02 TeV and in pp collisions at 13 TeV are under the internal review committee of ALICE collaboration.We have also participated in the data taking shifts for the ALICE experiment.

**STAR**

STAR experiment at Relativistic Heavy-Ion Collider (RHIC) facility primarily aims to understand the properties of strongly interacting matter formed, study of the dynamics, mechanism of particle production and exploring the Quantum ChromoDynamics (QCD) phase diagram in heavy-ion collisions. By varying the center of mass energy ($\sqrt{s_{NN}}$) of colliding nuclei, the STAR detector took data for Au+Au nuclei collisions over a wide range of energies ($\sqrt{s_{NN}}$ = 7.7 - 200 GeV) in phase I of Beam Energy Scan (BES I). We are involved in the study of conserved charge fluctuations, identified particle production and their anisotropic flow measurements. The transverse momentum ($p_T$) spectra, particle yields (dN/dy), average transverse momentum ($\langle p_T \rangle$) of $\pi^{\pm}$,$K^{\pm}$,p($\bar{p}$) are measured in Au+Au collisions at $\sqrt{s_{NN}}$ = 14.5 GeV and U+U collision at $\sqrt{s_{NN}}$ = 193 GeV. The measured $p_T$spectra and particle yields are used to extract the freeze-out parameters. This analysis is in paper stage and the first draft is under collaboartion review.

The deformed shape of Uranium nucleus gives the opportunity to assess the initial geometry in order to better test our understanding of the initial state of heavy ion collisions and the subsequently formed fireball. The azimuthal anisotropy of the identified particles relative to the reaction planeprvides imortant tool to study the dynamics and the collective properties of the medium. We have measured the flow coefficients $v_n$ for n = 2, 3, 4 for $K^0_S$, $\varphi$ and $\Lambda$ in U + U collision at $\sqrt{s_{NN}}$= 193 GeV. A paper draft on this study is under collaboration review.

One of the main physics interest of NISER group in STAR is the study of fluctuations of conserved quantities, such as baryon number (B), strangeness(S) and electric charge (Q). These measurements provide insight into the nature of phase transitions of matter created in high - energy nuclear collisions. The higher moments of multiplicity distributions of net-proton (proxy for net-baryon), net-kaon (proxy for net-strangeness) and net-charge are expected to show large fluctuations near the QCD critical point. A beam energy scan program (BES -I & II) is ongoing to perform such studies. With this motivation of search for the QCD critical point, we have performed measurement of higher moments for net-proton, net-charge and net-kaon on

recently recorded high statistics data for Au+Au collision at $\sqrt{s_{NN}}$ = 54.4 GeV with the STAR experiment. Measurement of higher order cumulants always suffer from large statistical uncertainties. The measurement performed at $\sqrt{s_{NN}}$ = 54.4 GeV dataset gives a precise baseline at higher energy compared to the results at lower energy, due to high statistics of the dataset. We are also studying the mixed cumulants of proton and pion which are expected to be sensitive to the presence of a QCD critical point. Five ratios using proton-pion cumulants are constructed in order to cancel the parameter dependences of the QCD-based models and are expected to become unity near the QCD critical point. We are currently working on the measurements of these observables as a function of collision energy for the BES I datasets. We are also working on the measurements of cumulants in U+U collision at $\sqrt{s_{NN}}$ = 193 GeV. STAR experiment is currently recording the high statistics dataset for Au+Aucollisions at lower values of $\sqrt{s_{NN}}$ as a part of the BES II program at RHIC and our group at NISER will be doing the similar studies at BES II energies.

Along with the data analysis, our group has actively participated in the testing of inner-Time Projection Chamber (iTPC) detector, recently installed to take data for the ongoing BES II phase of the STAR experiment. We also participated in the data taking shifts for the STAR detector for currently ongoing BES II phase.

**CBM**

The physics program of the Compressed Baryonic Matter (CBM) experiment at FAIR is focused on the measurement of properties of nuclear matter at high net-baryonic density. This is an upcoming heavy-ion experiment which offers the possibility to find signatures of discontinuous transition from QGP to hadronic phase and the QCD critical point where the first order phase transition ends. A good signature of a phase transition and a CP is the non-monotonic variation of observables related to the cumulants of the distributions of conserved quantities such as net-baryon (B), net-charge (Q), and net-strangeness (S) number with $\sqrt{s_{NN}}$ in event by event basis. These cumulants ($\kappa^n_\alpha$; $\alpha$ = B,S,Q) are related to the higher order (n) thermodynamic susceptibilities ($\chi^n_\alpha$) of the system, and takes large values near the phase transition.In addition to the diagonal cumulants discussed above, it is also possible to construct off-diagonal cumulants for the conserved quantities (Q,B,S). These off-diagonal cumulants of orders m and n ($\kappa^{m,n}_{\alpha,\beta}$) relate to the off-diagonal thermodynamic susceptibilities ($\chi^{m,n}_{\alpha,\beta}$) and allow the study of baryon-strangeness correlations. The off-diagonal cumulants are also expected to elucidate the character of chromodynamic matter. The mixed susceptibilities (baryon-strange, baryon-charge) have been reported to differ significantly in the Hadron Resonance Gas (HRG) model and lattice QCD calculations. The off-diagonal cumulants at second-order is also shown to be sensitive to the difference between calculations from the ideal HRG and lattice QCD. Therefore, measurement of these cumulants of net-multiplicity distributions can put constraints on various models which describe QCD matter.

We have performed simulation work on conserved charge fluctuations in Au-Au collisions at Elab = 10 AGeV. The simulations have been performed within the CbmRoot framework. Three million minimum bias events generated using Monte Carlo event generator UrQMD are transported

through the CBM detector set up using GEANT3. Two contributions related to these studies will appear in the CBM progress report 2018.

### SuperCDMS

SuperCDMS is a direct dark matter search experiment that uses cryogenic solid state detectors to look for nuclear recoil signals from dark matter. In SuperCDMS, NISER has been involved in calibration, background studies, search for lightly ionising particles (LIPS) and detector Monte Carlo (DMC) simulations.

1. LIPs have been successfully incorporated into the GEANT4 simulation package. The energy deposition probability distribution for LIPs in germanium detectors has been obtained using GEANT4. A journal article about this work is under p reparation.
2. Intensity limit for LIPs in the CDMS detectors has also been calculated which will be reported as a journal calculation soon.
3. NISER is also involved in the calculation of Si-32 background which is very crucial for dark matter experiments employing Si detectors.

### MINER

The Mitchell Institute Neutrino Experiment at Reactor (MINER) is a coherent neutrino scattering experiment which aims to map the so called 'neutrino floor' which is very crucial for low mass dark matter experiments performed at lowe r recoil energy thresholds. Other interesting physics which MINER intends to do is the measurement of the neutrino magnetic moment; evidence for new mediator bosons; sterile neutrino etc. NISER is involved in a big way in this project. NISER has procured a Cryogen-free dilution refrigeration that will initially be shipped to Texas A & M University where the experiment will take place. NISER is also contributing to the thermal neutron shielding of the experiment by providing boron rubbers produced in India. The system loaded with electronics and detector will then be used in India for various experiments requiring cryogenic detector systems. The experiment will provide expertise in handling cryogen refrigeration systems, cryogenic detectors and electronics th at will aid greatly in future Indian dark matter search experiments such as DINO.

### DINO

NISER is engaged in the backgrounds and calibration efforts in the first phase of DINO, a dark matter search experiment in Jaduguda laboratory, India. Neutrons are one o f the most important backgrounds in this search as they interact with the detector materials in the same way as WIMPs. In underground laboratories, neutrons can be generated mainly by spontaneous fission of Uranium and radiogenic processes, such as by U/Th ($\alpha$, n) reactions on the rock materials and by cosmogenic processes, such as interaction of cosmic ray muons with rock and shielding materials.

1. The flux of cosmogenic and radiogenic neutrons expected in the Jaduguda mines has been estimated. A journal arti cle to publish the results is under preparation.

## Phenomenology

We are also involved in the various analysis using QCD based models like PYTHIA, transport models like AMPT, UrQMD and thermal model like THERMUS, THERMINATOR and Hadron Resonance Gas (HRG) model.

We have performed a study on the role of suspected resonance states that are yet to be confirmed experimentally, on different thermodynamic quantities as well as the higher -order fluctuations and the correlation between conserved charges using ideal hadron resonance gas (HRG) model. The temperature dependence of the various thermodynamic quantities is studied and compared them with the lattice QCD result. We observe that the values of the bulk thermodynamic variables such as pressure, energy density, entropy density and second-order susceptibilities are increased by the inclusion of the additional resonances. We have also investigated the finite system size effect of hadronic matter on its transport coefficients such as shear viscosity, bulk viscosity, and electrical conductivity. The thermodynamical quantities such as entropy density, speed of sound and the transport coefficients are calculated using HRG model. All these quantities are found to be sensitive to finite system size effects of hadronic matter. The effect of finite system size is found to be more when the system is at low temperatures and is reduced at high temperatures. Owing to the intimate linking between system size and centrality, we have studied the centrality dependence of transport coefficients. We have also explored to link of our results with the macroscopic picture of hydrodynamical evolution.

We have extended the HRG approach by includind interactions using relativistic virial expansion of partition function. The noninteracting part of the expansion contains all the stable baryons and mesons and the interacting part contains all the higher mass resonances which decay into two stable hadrons. The virial coefficients are related to the phase shifts which are calculated using K-matrix formalism in the present work. We have calculated various thermodynamics quantities like pressure, energy density, and entropy density of the system. A comparison of thermodynamic quantities with noninteracting HRG model, calculated using the same number of hadrons, shows that the results of the above formalism are larger. A good agreement between equation of state calculated in K-matrix formalism and lattice QCD simulations is observed. Specifically, the lattice QCD calculated interaction measure is well described in our formalism. We have also calculated second-order fluctuations and correlations of conserved charges in K-matrix formalism. We observe a good agreement of second-order fluctuations and baryon-strangeness correlation with lattice data below the crossover temperature. We have three publications based on these studies.

Our group is also interested in the systematic study of the freezeout conditions in heavy-ion collisions. We have performed a study on the system size dependence of freeze-out conditions extracted from transverse momentum spectra of hadrons using THERMINATOR event generator. This work is published in Physical Review C.

## Hardware activities

### 1. Neutron detectors for rare event experiments

1. A commercially procured liquid scintillator detector of 2" (dia) x 2" (height) has been characterized using an Am-Be neutron source. Simulations are being performed using GEANT4 toolkit to unfold the experimentally obtained spectrum to obtain calibration in the neutron energyscale.
2. In collaboration with Crystal Technology Lab, BARC thermal neutron detectors made of LiI (Lil) and GGAG (Gadolinium Gallium Aluminium Garnate) are being tested. We have been able to generate thermal neutrons by slowing down fast neutrons using polythene sheets. Thermal neutrons produced in the lab have been detected with these detectors. The efficiency of LiI detector for thermal neutrons is determined to be ~10% using our setup and simulation. This agrees with measurements done by the BARC group using a standard thermal neutron source at BARC.
3. Once the detector characteristics are fully understood, they will be ready for deployment in rare event search experiments such as neutrino and dark matter.

### 2. Advanced gas detectors:

**a) Resistive Plate Chamber (RPC) for use in the 3$^{rd}$ and 4$^{th}$ stations of the MuCh subsystem in the CBM experiment**

The MuCh subsystem at the CBM experiment in FAIR requires detector rate handling capability of 15 kHz/cm$^2$ in the 3$^{rd}$ station and 4 kHz/cm$^2$ in the 4$^{th}$ station respectively

1. Simulation studies have been performed to determine the conditions required to operate an RPC in a mode with low charge production to increase its rate capability. Simulations show that in principle RPC can be operated to produce charge as low as 50 fC. However, detector and electromagnetic noise determine the lowest charge achievable in reality
2. Experimental studies have been done on a glass RPC to operate in a low charge production mode. We have been able to operate a glass RPC with a mean charge of ~200 fC with an efficiency of ~50%. This translates to a rate handling capability of ~8 kHz/cm$^2$. We plan to perform further experiments with RPC assembled using low resistivity electrodes ($10^{12}$ ohm.cm) and multigap configurations to achieve the required rate capability. A journal article is under preparation to publish the results.
3. We will perform experiments with alternative gas mixtures having low GWP (Global Warming Potential).

**b) Micro Pattern Gaseous Detectors (MPGD) for high energy physics experiments and societal applications**

MPGDs are gaseous detectors that are used or being proposed in many high energy physics experiments around the world. They have remarkable position resolution, reasonable time resolution and show excellent radiation hardness. They are most suitable to be used in forward regions of accelerator experiments and also being tested for space applications. They are also potential candidates to be used for societal applications such as medical imaging, diagnosis and contraband identification.

1. An ISO-5 clean room of ~200 sq.ft has been constructed and commissioned.

2. An X-ray generator from AMPTEK has been procured to test and characterize MPGDs.
3. Enclosure for X-ray irradiation ready and to be installed soon.
4. Gas Electron Multiplier detectors will be assembled and tested for use in societal applications.

**Dr. Sanjay K Swain, Associate Professor**

The group led by Sanjay Swain, work in CMS experiment at LHC, CERN. The main focus of the group is to perform data analysis using pp collision data. The main areas of in terest are

(i) B-physics: Here the group is involved in rare B -decays such as Bs->mumu, B->K*+mumu and B->K+mumu. These are very rare decay modes and are good tool to look for physics beyond standard model. Currently also the group started working in life time analysis of Bs ->mumu decay. This has never been done at all so far. This measurement will be the first and can give us hint for NP phenomena.

(ii) Also the group is involved in SUSY analysis, particularly, the susy top -squark production using all hydronic decay mode. This decay is considered to be the most sensitive decay to look for susy top. Although they have not found any SUSY particle at LHC yet, but this measurement can push the limit to exclude the mass of SUSY as they get more and more data.

(iii). Apart from this, the group has taken many important roles in B -physics ad SUSY groups, such a student from NISER-CMS group are leading the triggering validation, data validation, implementing new trigger path which can be used to start new analysis in favorable condition."

**Dr. Subhankar Bedanta, Associate Professor**

The group led by Dr. Subhankar Bedanta works broadly on the static and dynamic properties of magnetic thin films. A summary of research activities of the past one year has been given be low.

**Study of skyrmions in magnetic thin films:** The main focus in this area is to study nucleation, stabilization and propagation of skyrmions in various heavy metal/ferromagnet and heavy metal/ferrimagnet heterostructures. We plan to minimize the size o f the skyrmions and the skyrmion Hall effect (SHE) in such heterostructures for possible application in skyrmionic devices. By performing micromagnetic simulations, using OOMMF and MuMax, the group has successfully studied the formation and stability of sk yrmions for different values of anisotropy (*K*) and interfacial Dzyaloshinskii-Moriya interaction (iDMI). At present, the group is focused on skyrmion manipulation by electrical current in various device geometries of ferromagnetic, ferrimagnetic and antiferromagnetic systems.

**Flexible Spintronics**: Our group also working onthe effect of variable strain (due to bending, peeling, stretching, etc.) on the magnetization reversal, domain and relaxation dynamics of flexible thin films. Magnetic anisotropy of mag netic thin film was found to increase under application of tensile strain while the domains remain unaffected under stress. Additionally, insertion of another layer of organic material ($C_{60}$) onmagnetic films deposition on a flexible

substrate shows a remarkable decrease in the size of magnetic domains in comparison with its parent film.

**Organic spintronics :** The group also focuses to study spin transfer mechanism across ferromagnetic/organic semiconductor interface. The group has successfully demonstrated t hat non-magnetic fullerene ($C_{60}$) can attain an induced magnetic moment as high as ~ 3? $_?$ in a Fe/$C_{60}$ bilayer system. The magnetic interface has been quantitatively evaluated by polarized neutron reflectivity experiments performed at FRM II (Muenich, Germany) and Rutherford Appleton Laboratory (Oxford, UK). The group has also investigate d interface magnetism at non-magnetic Cu and $C_{60}$ heterostructure via x-ray magnetic circular dichroism measurements performed at the synchrotron lab ALBA, Spain. At present, they are exploring antiferromagnetic/organic semiconductor interfaces.

**Spin pumping in ferromagnetic/heavy metal heterostructures:** The group has been working extensively on spin dynamics of Heusler alloy/heavy metaland manganite/heavy metal bilayers. The studieswere carried out mainly using ferromagnetic resonance (FMR) spectroscopy b ased inverse spin Hall Effect (ISHE) measurement set up developed in-house. From our study, the spin pumping voltage of $La_{0.67}Sr_{0.33}MnO_3$/Pt bilayer, due to ISHE, was found to be comparable with the standard FM/HM system like Py/Pt.In another study, the gro up has studied spin dynamics by replacing the heavy metal with a topological insulator having surface metallic states. Recently the group is exploring various antiferromagnetic (AFM) thin films to study the spin dynamics for possible applications AFM spintronics.

**Synthetic antiferromagnets**: Synthetic antiferromagnets (SAF) is another area of interest of the group due to its rich physics and potential applications in data storage, magnetic sensors, *etc*. We have successfully deposited samples of SAFs having multilayer stacks of ferromagnet and heavy metal separated by metallic spacer layer using multi deposition sputtering system. The aim is to optimize the thickness of spacer layer to achieve antiferromagnetic interlayer exchange coupling.

**Intrinsic 2D ferromagnetism and FM/2D material heterostructures:** One of the main aimsof this project is to study intrinsic 2D ferromagnetism in trichalcogenide single crystal after exfoliation. In such single crystals, layers are stacked together via van der Waals interac tion and we plan to studymagnetic properties of such exfoliated layers. Another aim of this project is to fabricate ferromagnetic (e.g. Fe, Ni, Co)/2D material (e.g. $MoS_2$, $WS_2$) heterostructures for fundamental studies like extraordinary Hall effect (EHE), magnetic proximity effect, magnetization dynamics and to explore their possible application in magnetic field sensing.

**Static and dynamic properties of soft/hard ferromagnetic (FM) or ferromagnetic/ antiferromagnetic (AFM) bilayers**: Soft/hard ferromagnetic bilayers have been studied extensively by the group due to its high energy product ($BH)_{max}$ value compared to the component layers. In such bilayers, interface properties can be tuned to improve the energy product. We have studied the static and dynamic m agnetic properties of soft (Co, $Ni_{81}Fe_{19}$)/hard ($Co_{40}Fe_{40}B_{20}$, Fe) magnetic bilayers with improved ($BH)_{max}$ compared to their component layers. The role of interface in tuning dynamic properties like Gilbert damping constant, $\alpha$, has also been brought out. Additionally, the group has studied exchange bias in FM/AFM type Fe/$Ir_{20}Mn_{80}$

bilayers to explore the role of FM/AFM interface and 'bulk' part of the AFM in its overall magnetic behavior.

**Dr. Subhasis Basak, Reader-F**

Presently the group in working on Charm onium spectroscopy with overlap fermions and 2+1+1 highly improved staggered quark (HISQ gauge) configurations.

**Dr. Chetan Gowdigere, Reader-F**

Contemporary Topics in String and Field Theory

3. Study of Fermion Zero Modes above Black Hole Solutions in Supergravity Theories
1. Study of Monopole Operators in Three Dimensional Chern-Simons-Matter Theories
2. Applying Conformal Bootstrap Techniques to Study Universality Classes in Statistical Mechanics

**Dr. Yogesh Srivastava, Reader-F**

In past one year, the group (including PhD students Deepali Mishra, Pooja Jethwani and Swayamsidha Mishara) and collaborators Amitabh Virmani and Sudipta Mukherji has worked on new solution generating techniques in supergravity and problems in quantum field theory (and string theory) on cosmological backgrounds.

With Deepali Mishra and Amitabh Virmani, He has found a generalization of Garfinkle-Vachaspati solution generating technique which has found many uses in String theory. This generalized-garfinkle-Vachaspati technique was developed in the context of minimal six dimensional supergravity and was subsequently generalized to include dilaton. Are working on generalizing this technique to different supergravity theories. These techniques are quite useful in constructing black hole microstates in String theory and were applied to construct supersymmetric microstates of D1-D5 system.

With Swayamsidha Mishra and Sudipta Mukherji, he has been working quantum fields in curved spacetimes and AdS cosmology. A technique relating how scalar fie lds in different FRW spacetimes can be related was worked and applied to FRW spacetimes. They are currently working on AdS duals of FRW spacetimes.
With Pooja Jethwani, He is also working on BMS symmetries in String theory.

**Dr. Joydeep Bhattacharjee, Reader-F**

**Computational Materials Scieince from first principles and model Hamiltonian**
**Direction of research:**
magnetism, catalysis, transport, topological protection of states etc. in the lightest low-dimensional systems - graphene, hexgonal boron nitride, germanene etc. and their hybrids and functional forms

**Introduction:**

With the aim of proposing new materials and methodologies towards solving some of the contemporary problems faced by humanity, such as, securing clean green energy resources and environment, our group focuses on computationally understanding electronic, optical and magnetic properties, and their interplay in primarily low-dimensional systems from first principles as well as model Hamiltonian. We compute and analyse electronic structure o f the ground and excited states in layered structures made of the lightest of the elements known to self-assemble into extended structures in normal temperature and preassure, namely, boron, carbon, nitrogen and oxygen, within the frameworks of density fun ctional theory with refinements to include self-energy corrections and correlations through mean-field approximation of Hubbard model.

**Dr. Prasanjit Samal, Reader-F**

Research Areas: Density-Functional Theory and Quantum Simulations Group.

Our research interest is about the development of computational methods for doing and to seek fundamental understanding of electronic structures of atomic, molecular and solid-state systems. Based on our understanding, we develop new computational methods pertaining to quantum many-body techniques to study various aspects of molecules and materials, including ground-state as well as excited-state properties. In electronic structure calculations, the most popular method is Kohn-Sham density functional theory (DFT), due to its high computational efficiency and useful accuracy. In this theory, everything is known, except for the exchange - correlation energy component, which has to be approximated as a functional of the electron density. Therefore, the central task of DFT is t o develop more reliable exchange-correlation functionals with improved accuracy. In the past few decades, many density functionals have been proposed and some of them have been widely used in electronic structure calculations. DFT is a simple, clever and yet versatile reformulation of the quantum many-body problem in which the ground-state energy is expressed as a functional of the electron density, avoiding the difficult calculation of the correlated wave function of the system. In the Kohn -Sham approach of DFT, the major part of the kinetic energy is in fact calculated with a single -determinant wave function, and only the so-called exchange-correlation energy describing the non-classical part of the electron-electron interaction needs to be approximated as a density functional. Numerous approximations have been proposed and often give a reasonable accuracy for a low computational cost, which is why DFT is the most widely used method in quantum chemistry and in condensed-matter physics till date. However, de velopment of DFT is still very active in order to reach an ever increasing accuracy, in particular for systems with long -range van der Waals dispersion interactions (interaction between quantum charge fluctuations) and systems with strong (or static) as well as dynamic correlation effects (partially filled near-degenerate orbitals). The general strategy that we follow consists in rigorously combining a DFTtype approximation with an explicit wave-function-type calculation based on a decomposition of the electron-electron interaction. The objective is to design methods with relatively low computational cost and that improve the accuracy of today's DFT. Density functionals can be divided into two broad categories: Semi-local and non-local density functionals. The former is developed using local or semi-local information, such as the electron density, the gradient of the density, and Kohn-Sham orbital kinetic energy density, and thus is computationally more

efficient, while the latter is developed by adding non -local information, such as exact exchange energy density, and thus is potentially more accurate, because this kind of non -local functional can satisfy exact constraints beyond those satisfied by semi -local DFT. The problem is how to build nonlocality into semi-local DFT, without losing the accuracy that semi -local DFT has already achieved. We are currently developing semi -local DFT using novel methods, aiming to consistently improve the accuracy and applicability of meta -GGA functionals. Then we build non-locality into our new functionals to construct non -local DFT, such as local -hybrid and local-range separation functionals. Also, we incorporate long -range van der Waals interactions into the framework of DFT to study electronic structure of molecules, polyme rs, clusters, and solids.
Research Themes & Outline: Methodological developments for 2D Quantum Dots Systems within DFT.

- Development and bench-marking of semi-local exchange-correlation functionals.
- Range-Separated Hybrid density functionals for fin ite and extended systems.
- Material simulation from the non-local vdW corrected meta -GGA functionals.
- Orbital free density functional theory & multiscale material modeling. Novel properties of the materials through the accurate density functional app roaches
- Construction of exchange-correlation kernel and TDDFT for excited -states.
- Investigating pressure induced phase transitions of nanostructures by DFT & first principles molecular dynamics method. Ab-initio computational methods for predicting the optical, electronic, structural and mechanical properties of molecules, clusters and semiconductors at the nanoscale.

Study charge transfer in third generation photovoltaics, Spin flip excitation in large molecules & extended systems. Magnetic functionalization of nanoparticles for bio-medical applications from first principles calculations.

Development of GGA & meta- GGA type exchange-correlation potentials or kernels from accurate wave-function based results for model systems of various classes o f excited-states to provide more accurate estimates of molecular properties.

**Dr. A. V. Anil Kumar, Reader -F**

The group led by Dr. Kumar aims to understand the complexity in understanding the interaction between charged colloidal particles in solutions in order to unravel some basic physics. Their research activity is described below.

The interactions between charged colloidal particles in solution can be complex and varied. One particularly interesting case is when the particles attract one another at smal l separations, but repel at larger separations. These competing interactions lead to very rich phase behaviour in these systems like formation of cluster fluids. Our investigations on a highly size -asymmetric binary colloidal mixtures shows that counter io n distributions around the colloidal particles are nonlinear and this leads to highly non-additive interactions between the two components. In such an asymmetric mixture, even though likely charged, larger colloidal particles form a cluster fluid which is in very good agreement with experimental findings. Similar effects may be observed in the case highly charge-asymmetric mixtures also. We are investigating the effect of this charge/size polydispersity in colloidal mixtures on phase behaviour and dynamical properties using classical molecular simulation methods such as Monte Carlo and molecular

dynamics. (This work is being carried out in collaboration with Prof. J. Horbach at German Aerospace Center (DLR), Köln, Germany).

**Dr. Sumedha, Reader-F**

Statistical Mechanics and interdisciplinary applications
. They are interested in understanding the signature of multicritical points in three dimensions using conformal bootstrap methods.
2. They have been looking at the effect fo disorder on the phase diagram of v arious models.
3. They are interested in understanding the role of crowding and confinements on biopolymers.
4. They try to model subcellular processes using stochastic equations.

**Dr. Colin Benjamin, Reader -F**

Theoretical Nanoscience, Quantum Information theory and Game theory:
The research activity of the group concerns three broad fields -
(a) Theoretical Nanoscience- The focus here is on:
(i). Thermoelectrics*:* Graphene and topological insulators(TI's) are used to design better quantum heat engines and refrigerators both in spin and charge domains.
(ii). Quantum transport*:* Resistance and HBT noise in TI's and graphene are used to probe entangled states and novel phenomena like quantum spin/anomalous Hall effects in 2D TI's in presence of disorder and inelastic scattering and analyze their resilience.
(iii). Josephson Effect*:* We look at novel phenomena occurring via Andreev reflection in metals as well as Graphene/TI's so as to design qubits. Students worked or working on theoreti cal nanoscience in this period:
1. Arjun Mani, from Jun. 2015-May 2018. Ph. D awarded Dec. 2018. Currently, Postdoc at Univ. of Southern California.
2. Subhajit Pal, working on his Ph. D from Dec. 2015 onwards.
3. Tusaradri Mohapatra, working on her Ph. D from Dec. 2017 onwards.

(b) Quantum information theory- Focus mainly on quantum walks, and interaction free measurements.
(c). Game theory: Focus on evolutionary games and Nash equilibrium in the thermodynamic limit for classical and quantum games.
*Students worked or working on quantum information theory and game theory in this period:*
1. M. Abhishek Raj, worked on his 6$^{th}$ semester project from Jan. –May 2019.
2. Aditya Dash, worked on his Master's thesis on "Interpreting Susceptibility and Correlation in the thermodynamic limit of classical and quantum games" from Aug. 2018 -May. 2019.

**Dr. Pratap Kumar Sahoo, Reader -F**

The group led by Dr. Sahoo carries out experimental investigation of nano -materials and ion matter interaction. The main two research areas are mentioned below.
Tunnel devices are very important for technological application. The basic phenomena can be understood in terms of the physics behind the electron and phonon-tunnel device, which depends on the device geometry. The group is involved to fabricate novel structure with low

cost techniques for tunnel devices. Recently they have synthesized crystalline -amorphous-crystalline (*c-a-c*) stature which can be used as phonon-tunnel junction devices. Similar structures like *c-a-c* with p-n-p electronics devices also of great interest which can be fabricated using low energy ion beam facility.

Single Nanorod based n-n-p transistor: Tandem p-n junctions have been synthesized in ZnOnanorods (NRs) by implantation of 50 and 350 keV O+ i ons. We have demonstrated the single nanorod based p-n, p-n-p and p-n-p-n type tendom junction after successive ion implanation using suitable ion energy and ions. These Nanorods are also highly luminescence, which can be used as phodiodes and photo transistors.

New Phase synthesis using ion beams: In general, study of stable phases of Ni-Bi system would be quite interesting for superconducting, ferromagnetic and often their coexistence at certain conditions. We have synthesized NiBi and NiBi3 phases usi ng ion energy range from 1 MeV to 120 MeV and optimize the parameter for highest mixing rates where the stable phase can exit. We show the swift heavy ion (120 MeV Au ions) induced electronic energy loss plays an important role to enhance the interface mixing of Ni-Bi stable phases as a function of ion fluence. Also, a molten-like surface morphology has been realized due to latent thermal spike along the ion track upon swift heavy ion irradiation. The enhanced mixing and evolution of molten like surface morphology after ion irradiation has been explained on the basis of the inelastic thermal spike model calculations. These calculations were extended for the higher energies to understand the threshold energy of molten phase which may transfer the materials to a stable phase to realize the suitable properties for technological applications.

Also optical excitation by coupling a foreign atom by ion implantation to propagate surface plasmons and its anisotropic optical response due to the strong transverse and longitudinal plasmons coupling is a hot recent research area. Ion beams are also indispensable tools to dope materials with optically active ions. Ion irradiation can also lead to nanoscale changes in the structure and shape of materials such as colloi ds, Si nanostructures and lithographic masks. The thermal spike that is generated along the ion track leads to anisotropic deformation, with the material expanding perpendicular to the ion beam. Continuum modeling is used to determine the fundamental mechanisms behind these ion-solid interactions. The first attempt in this regard is to fabricate the nanostructures using various lithographic techniques, thin film deposition and energetic low and swift heavy ion beam implantation and study the strong interact ion of light with nano structured materials which lead to the design of plasmonic devices with optimized properties.

**Dr. Kartikeswar Senapati, Reader-F**

Superconducting spintronics

The field of spintronics (spin-controlled electronics) has evolved a new b ranch of research in the past decade, where superconducting material play an important role, in addition to primarily magnetic functionality of usual spintronics devices. On a broader scale, this branch of research, known as "Superconducting spintronics", has the potential to address several key aspects solid state quantum computation.

Along this direction, our work primarily focuses on two aspects: (i) spin-triplet superconducting devices, where electronic transport behaviour of low temperature Josephson junctions are studied with a variety of synthetic magnetic barriers with the goal to make functional spin-triplet SQUIDs.
(ii)Thermal and quantum Phase-slip behaviour in nanowires are studied in proximity of ferromagnetic layers with the goal of understanding and using high speed Josephson junction like response due to phase-slip phenomena in nanowires.

**Dr. Ashok Mohapatra, Reader-F**

Currently, the group is working on 2 major projects.

1. Study of coherent Rydberg excitation in a thermal and ultra-cold atomic vapor.

The long term objective of the project is to realize strong photon-photon interactions using the non-linearity mediated by Rydberg blockade interaction. Rydberg blockade is the phenomenon where more than one atom within the blockade volume can not be excited to the Rydberg state using a monochromatic laser beam due to strong Rydberg-Rydberg interaction. Recently the group has demonstrated the blockade interaction in thermal atomic vapour which has a potential application in quantum information processing and quantum computation. The group is also involved in developing an ultra-cold set up to study blockade interaction as well as interaction facilitated enhanced Rydberg excitation. The group is involved in exploring the possibility of four-photon excitation to the Rydberg state where the residual Doppler shift in thermal vapour can be overcome using Suitable beam geometry. Such a system is expected to generate the optical nonlinearity similar to the cold atoms with much reduced the experimental complexity associated with the cold atoms.

2. Study of Mirrorless optical parametric oscillator (MOPO) using four wave mixing (FWM) enhanced by ground state coherence in thermal atomic vapour

Ground state coherence in atomic vapour can enhance the optical non-linearity and one of the striking examples are EIT induced enhancement of cross-phase modulation (XPM) and four wave mixing (FWM) etc. In this project, our group has demonstrated the Zeeman coherence induced enhancement of FWM and XPM of weak probe beam with a linear polarisation in the presence of a strong pump field with orthogonal linear polarisation. Further investigation leads to the study of polarisation rotation of an elliptically polarised light propagating through a medium with such efficient non-linearities. Along the similar direction, we extended our study to find suitable parameter regime to observe an effect called MOPO, where the new fields are generated spontaneously through FWM process in the presence of strong pump and control fields . In this case the driving fields are counter-propagating to each other leading to the feedback due to efficient FWM in the system. The generated fields have a lasing threshold which has been studied in the same system in the last decade. However, the system has also possessed large XPM of the generated fields due to the presence of strong driving fields resulting in all-optical wave-guiding of the generated fields. The correlated wave-guided modes like Gaussian, Laguerre-Gaussian and Hermite-Gaussian modes are observed depending on the experimental parameters. Further investigation shows optical bi-stability in the lasing threshold to be addressed in the future.

**Dr. Ritwick Das, Reader-F**

The research group led by Dr. Das focuses on nonlinear photonics, pl asmonics and waveguide optics. The main areas of research are described below.

Optical Parametric Oscillators or OPOs provide an alternative and practical route to reach those spectral regions that are inaccessible to conventional laser technology, by exp loiting nonlinear optical properties of non-centro-symmetric crystals. An interesting configuration of OPOs is singly-resonant OPOs or SROs where only one of the generated waves oscillates between a pair of mirrors forming a very stable source of generatin g coherent radiation. The frequency tunability is achieved by either changing the properties of the crystal such as temperature or angular orientation with respect to the pump beam, or by inserting a frequency selective element in the cavity such as an etalon which manipulates the longitudinal resonance condition. In the present research work, the main idea is to generate high-power, continuous-wave, coherent radiation in the mid-infrared that is tunable from 2-6 μm. This wavelength region is extremely cruc ial for carrying out absorption spectroscopy of trace-gas molecules such as methane, formaldehyde, nitrogen, carbon-dioxide and many more.

The research work essentially comprises study of modal interaction between bandgap -guided modes in a dielectric medium and surface plasmon modes. The dispersive properties of the waveguides, anti-crossing behavior and propagation loss features are being investigated in detail. Another interesting feature that involves the existence and excitation of 'Tamm -plasmon' states is also being investigated. The major goal of this research activity is to provide alternative as well as efficient route for signal processing in the miniaturized photonic integrated circuits and realization of efficient biochemical sensors.

**Dr. Prolay Kumar Mal, Reader-F**
(Ramanujan Fellow 2013-18)

Brief of Research Activity
The Standard Model (SM) of Particle Physics is the theoretical framework explaining the dynamics of the subatomic particles viz., quarks, leptons and gauge bosons, and their interactions. The discovery of the SM Higgs boson by the LHC experiments (ATLAS and CMS) has finally culminated the long-standing puzzle of electroweak symmetry breaking (at least within the context of the SM). However, in spite of its great accuracy in explaini ng the wide range of experimental data over the past few decades, it has several shortcomings (e.g., no dark matter candidate, mass hierarchy problem, etc.) and it is believed to be a low -energy limit of a more fundamental theory.

Dr. Mal's primary research focuses on the understanding of the basic mechanism responsible for the electroweak symmetry-breaking and to probe new physics beyond the standard Model (BSM) of Particle physics. He works with the CMS detectors at the Large Hadron Collider (LHC) involving the top quark and Higgs boson. Presently, he and his group members are looking into the rare signatures of top pair production in association with photons and Z boson with LHC Run II dataset at $\sqrt{s}$=13 TeV. In the context of SM Higgs and beyond, his group membersare intensely

involved in the Run II analysis with diphoton signature. His students and group members are also pursuing precision measurements on some of the top quark properties (decay wi dth and W-helicity).

In addition, he is leading the NISER-CMS group in terms of CMS detector upgrade program scheduled in next few years. During this period the LHC is scheduled to undergo several luminosity upgrade programs where the number of interactio ns per proton-proton branch crossing would heavily be increased. In such an environment, any physics analyses would require event filtering based on the tracking detector. Dr. Mal is actively involved in the CMS upgrade program for developing suitable trac k triggering mechanism, as well as in building the tracking detector for High-Luminosity LHC (HL-LHC). During HL-LHC, the CMS Outer Tracker (OT) would completely be replaced with a brand new Silicon pixel/strip detectors. Detailed designing and feasibility studies for the same have been documented in the CMS OT Technical Design Report []. NISER-CMS has group has taken the responsibility to build 2000 modules consisting of Silicon strip detectors. The responsibility involves assembly of such detector modules, electrical testing and temperature cycling, and integration of the modules into ladder structure. Presently, the NISER-CMS facility is setup with most of the major equipments required for this assembly works. The ladder integrated strip detectors are exp ected to delivered/shipped to CERN by 2023, while successful prototyping of modules are to be completed by 2020. Dr. Mal is the contact person from NISER-CMS group for the successful execution and timely delivery of these detectors to CERN. Furthermore, he and his group members are working on the performance studies for the present CMS tracker, studies with different HEP event generators, development of monitoring tools for CMS L1 trigger system, etc. He has regularly been participating in CMS detector oper ations and data-taking.

**Dr. V Ravi Chandra, Reader -F**

The group has worked on the following projects in the academic year 2018 -2019.

1. We have developed a general numerical tool to analyse magnonic band structures for generic Bravais lattices with a given number of sublattice sites at a particular Bravais lattice point and fairly broadly defined two-spin Hamiltonians on them. The programs written have been benchmarked against the results for models which have been studied recently and we have analysed dispersions, Chern
Numbers and transverse thermal conductivities for those models (eg. Kagome with isotropic exchange, Dzyaloshinskii-Moriya interaction and exchange anisotropy) to ensure the accuracy of the program.
We are currently working on a detailed st udy of the topological properties of the ferromagnetic pyrochlore lattice with Dzyaloshinskii-Moriya interactions. Experimentally, the first signatures for the magnon Hall effect were found for this system. Generalising existing analyses which study this system as a stack of two dimensional magnetic lattices, we plan to study the topological properties of magnons for the full three dimensional systems and probe the stabilityof the phases under perturbations like further neighbour interactions single site an isotropies etc.

This work is being carried out in collaboration with my PhD student Mr. Jyothis V V and preliminary results were part of the Master's thesis of Mr. Bibhabasu Patra who graduated in academic year 2018-2019.

2. A second project the group is studying involves searching for signatures of many body localisation (MBL) in the local density of states (LDOS) of interacting fermion models with site disorder.

Unlike several previous studies which focused only on the ground state we are interested i n the LDOS of highly excited states which becomes important when studying localisation phenomena in interacting systems. The preliminary data generation for the spinless fermion model with nearest neighbour hopping and interaction (with site disorder) has been completed for small system sizes of up to
16 sites. After identifying relevant disorder strengths, energy windows etc at smaller sizes we intend to study larger system sizes with pallalelised diagonalisation programs and provide a detailed analysis of LDOS features of such models for excited states and its connection with MBL physics.

This project is a collaboration with Mr. Atanu Jana who joined the group as a project fellow in 2018-19 and Prof. Arti Garg of Saha Institute of Nuclear Physics, Kolkata .

**Dr. Nishikant Khandai, Reader-F**

In the last one year they have been looking at a couple of problems in large scale structure. Alongwith my PhD student Saili Dutta we have been looking at the properties of HI selected galaxies in the local Universe. By looking at sub-populations, e.g. color-magnitude, of the HI selected galaxies we are able to show that different populations contribute to different regimes of the HI mass function.

The low mass end is dominated by faint blue and bluer galaxies, the knee is dominated by bright blue galaxies and the high mass end is dominated by red galaxies. The last part is puzzling since redder populations are associated with gas-poor early type galaxies. We are investigating this population of red galaxies and a preliminary analysis of their images show that these may be dusty galaxies.

With undergrad student Biprateep Dey we have further explored how to predict properties of HI selectedgalaxies from observational properties of their optical counterparts. We are using a machine-learning approach to tackle this problem. We are able to show that we can reproduce the distribution of HI masses and HI velocity widths separately. However, to correctly predict the number of HI detections we need to jointlypredict the HI mass-velocity for each galaxy.

With undergrad student Divya Rana and faculty Anamitra Mukherjee (co-advisor) we have explored the similarities between granular gases and self-gravitating systems. By considering the same initial conditions in the slightly non-linear regime we have been able to show that the evolved systems show similar characteristics in their distribution as well as their clustering.

A couple of projects are underway with Suchetana Chatterjee (Presidency) and Raghunathan Srianand (IUCAA). In the former we are looking at the x-ray signal in galaxy groups and how it can be used to study the property of the central supermassive blackhole. In the latter we are looking at the metal lines in the lyman-alpha forest and how these can be used to study th e IGM and ICM around galaxies and clusters of galaxies. Both these projects involve analysing cosmological hydrodynamical simulations.

**Dr. Anamitra Mukherjee, Reader-F**

(a) The collaborations started with Prof. Tanusri -Saha-Dasgupta at SNBCBS, Kolkata and Prof. Arun Paramekanti at University of Toronto for studying the physics of strongly correlated Nickel oxide systems has led to a paper that is published in Physical Review Letters. Current collaboration is continuing in understanding the microscopic mechanism behind stabilizing polar distortion in transition metal ferrates and uncovering the competition between polar and breathing mode distortions in negative charge transfer oxides. One paper in this long term project is complete and is being prepared for submission. (b) With his student Gour Jana, he has completed the work on the project of studying the Hubbard model with next nearest hopping. In this work, he has shown that their approach of Monte Carlo -Mean Field theory can capture Fermi liquid to NonFermi liquid crossover, magnetic phases and spin liquid behavior in this model and can be used to study the impact of temperature of these. The paper is under review in Physical Review B. (c) With his student Gour Jana, they are now looking to study super co nducting instability in the above-mentioned model and in the ionic Hubbard model. This work also has a collaborative component with Prof. Elbio Dagotto, University of Tennessee. (d) He has started co-guiding another PhD student Sayan Jana of IOP, jointly w ith Dr. Arijit Saha, faculty member of IOP. They have looked at the impact of strong correlation physics of topological phases in the 2 dimensional Lieb lattice. They have shown how a band topological insulator becomes a topological Mott insulator using slave rotor mean field theory. They have also shown how the edge states evolve under Page 2 of 3 increasing correlation effects. The work for this project is complete, the paper is under review in Physical Review B. (e) In collaboration with Arjit Saha, Sayan Jana IOP and Dr. Priyanka Mohan, TIFR, they have shown how light with certain kinds of polarization can melt a Mott insulating state in strongly correlated systems. The paper is being written up. (f) With Dr. Sanjukta Paul, postdoc at NISER, Anamitra is developing a way to apply Monte-Carlo mean field theory in rotation invariant multiband models for correlated materials.

**Dr. Ajaya Kumar Nayak, Assistant Professor**

The current research interest of their group is mostly focused on the manipulation of some of the noble magnetic structures for their potential application in spintronic devices. Some of the important research topics explored are discussed below.

**(I) Magnetic Skyrmions/Antiskyrmions**

Recently, a new type of skyrmion, called antiskyrmion, was found in thin plates of a family of acentric tetragonal Heusler compounds with D2d crystal symmetry. In a very recent work we utilize a noble technique, i.e., magnetic entropy change measurements, to characterize the

antiskyrmion phase in bulk materials. We have shown that the existence of antiskyrmion phase appears with a positive magnetic entropy change in contrast to the negative entropy change in the helical or ferromagnetic state. In another work we have found the signature of antiskyrmions in a Mn-Ni-Ga based tetragonal Heusler system.

**(II) Topological Hall Effect in Mn3Sn**

Electron transport in some of the non-trivial spin structures with finite topological number can result in topological Hall Effect (THE), arising from the real space Berry curvature. The Hall Effect measurements below 50 K in the non-collinear antiferromagnet $Mn_3Sn$ show the existence of a large topological Hall Effect, signifying the presence of some non-trivial spin structures like skyrmions.

**Dr. Victor Roy, Assistant Professor**

The present research of the group led by Dr. Roy is exploring the QCD phase diagram with the help of various allowed QCD Equation of State (EoS) and a newly developed 2(space)+1(time) dimensional relativistic hydrodynamic code. The group has recently develop ed an event-by-event relativistic hydrodynamic code and extensively tested it by comparing the numerical results with the known analytical results like the Riemann solution and the Gubser solution. Excellent agreement with the analytical results is observe d.

Lattice QCD results show that at high temperature and vanishing baryon chemical potential nuclear matter undergoes a crossover transition to quark-gluon plasma at crossover temperature ~ 170 MeV. It is also well known, that on the other hand nuclear m atter undergoes a first-order phase transition at high baryon chemical potential and finite temperature. It is obvious that the first-order phase transition ends at a critical point in the QCD phase diagram. The ongoing experimental program at RHIC, BNL aims to find and locate the QCD critical point by using different collision energy. Currently, the group is investigating the consequences of such a phase transition on the experimental observables by using two different EoS (with and without first-order phase transition) in the recently developed hydrodynamic code.

In addition, the instability and causality of relativistic magnetohydrodynamic are also being investigated in order to understand the effect of the transient strong magnetic field produced in the initial state of high energy heavy-ion collisions.

**Dr. Amaresh Kumar Jaiswal, Assistant Professor**

The current research of our group is focused on the space-time evolution of QCD matter formed in high-energy heavy ion collisions. We are interested in f ormulation of relativistic hydrodynamic equations, which takes into account the spin of fermions in the plasma. Polarization of observed hadrons will carry the signature of this effect that we are trying to incorporate in our formulation. We are also inter ested in finding the analytical solution of hydrodynamic equations for highly symmetric systems. Recently we have started working on propagation of heavy quarks, such as charm and bottom, and their bound states through the medium.

**Dr. Tuhin Ghosh, Assistant Professor**

The group led by Dr. Tuhin Ghosh focuses on certain aspects of Galactic Astrophysics and Cosmology. The activities of this group are described below.

a) PASIPHAE Project – Tuhin Ghosh and team has officially joined the PASIPHAE collaboration in March 2019. The aim of this experiment is to measure the polarization of millions of stars at areas of the sky away from the Galactic plane with unprecendented accuracy. The ultimate goal of the experiment is to reconstruct a tomographic map of the Galact ic magnetic field by combining the stellar distances provided by ESA's GAIA mission. The team is working on the pipeline code for the PASIPHAE instrument called WALOP South to correct for geometrical and artifically produced instrumental polarization effec ts.

b) Dust modelling using HI emission – Debabrata Adak (Ph. D. student at IUCAA) and Tuhin Ghosh have developed and extend a modelling framework to simulate polarized dust emission based on Ghosh et al. 2017 paper, making use of both the Planck data and Eff elberg-Born HI surveys over the northern Galactic cap. The seven -parameter dust model, incorporates three layers of HI gas in multiphase medium as a proxy for variable dust intensity and a phenomelogical model of Galactic magnetic field, is able to reprodu ce the 1- and 2-point statistics of observed dust polarization seen by Planck satellite at 353 GHz over northern Galactic cap. This work has important application in assessing the accuracy of component separation method used for CMB B-mode search.

c) Statistical characterization of dust polarization – Andrea Bracco (Postdoc at ENS Paris) and Tuhin Ghosh extend the Planck 2018 analysis to low Galactic latitude to investigate the correlation between the T-E-B auto- and cross-power spectra with the gas column den sity from the diffuse interstellar medium (ISM) to molecular clouds. For the first time, this work shows significant variations in T-E-B dust polariazation power spectra across the sky with gas column density and multipoles (angular scales). These results are key for accurate foreground separation for next generation CMB experiments targetting for B -mode signal.

d) Hamiltonian Markov Chain method –Debabrata Adak (Ph. D. student at IUCAA), Shabbir Shaikh (Ph. D. student at IUCAA) and Tuhin Ghosh are developing a new and powerful tool to make bayesian inference of dust-HI correlation using diffuse interstellar medium. The team employ Hamiltonian Monte Carlo (HMC) sampling method to sample the large dimensional parameter space. In their application to HMC, they si multaneously fit fsky * 12 * $N_{side}^2$ + 1 parameters to a given Planck frequency, where $f_{sky}$ ranges from 0.1 to 0.2 and $N_{side}$=32. The HMC method is successfully applied to the simulated Planck maps to estimate the dust emissivities. The next step is to apply HMC method to the real Planck data and obtain reliable estimate of dust emissivities and cosmic infrared background anisotropies map.

e) Stacking of pairs of Luminous Red Galaxies (LRGs) – Tuhin Ghosh and Baibhav Singari (M.Sc. student at NISER) have been searching for warm/hot filamentary structure between a pair of LRGs using the publicly available Planck data. In their analysis, the raw Planck maps are stacked up at the location of LRG pairs separating within a radial and tangential distance of $6h^{-1}$ Mpc. The angular position of each LRG pair is rotated and scaled so that they lie on a common reference frame. They found statistically significant signal coming from warm/hot

filamentary structures connecting two LRGs. Through this study, they also quantify the level of foreground contamination in the detected signal.

**Dr. Najmul Haque, Assistant Professor**
Properties of meson in external magnetic field

The group is currently involved to study the magnetic field dependant pion mass in the framework of Non-linear sigma model coupled to quark. This calculation can also be extended at finite temperature and the group is planning to compute neutral pion as well as some other meson properties at finite temperature and magnetic field in future.

**Dr. Kush Saha, Assistant Professor**
Currently, the group of Dr. Kush Saha is mainly interested in studying quantum phenomena in open systems. Below he sketches some of those topics -

Dissipation in interacting bosonic systems:
Although dissipation in quantum systems leads to decoherence of quantum states, recent years have witnessed an upsurge in allowing dissipation on purpose to study non-equilibrium dynamics in various physical systems such as optical cavities, trapped ions, exciton-polariton BECs. This is in partbecause dissipation can be used as an efficient tool for preparing and manipulating quantum states, and in part because the interplay between unitary and dissipative dynamics leads to the emergenceof non-equilibrium steady states. In view of that, Dr. Saha and one of hiscollaborators from abroad are trying to understand dissipative dynamics of the Bose-Hubbard model using Gutzwiller mean-field (GMFT) theory for density matrices and also using exact diagonalization. It turns out that the one-body loss rate and long-time dynamics can be used as a probe to identity Mott and superfluid phases in this system.

Topology in open quantum system:
Rahul Ghosh, an integrated PhD student of Dr. Saha, is working on band topology in systems with loss or gain, namely non-Hermitian topological systems. Rahul's main goal is to develop and understand the notion of bulk-boundary correspondence and edge modes in such non-Hermitiansystems.

**Dr. Ashis Kumar Nandy, Assistant Professor**

(Ramanujan Fellowship 2019 - )
Within a theoretical framework, Dr. Nandy's group is broadly interested on magnetization dynamics in a multiscale environment comprising first principles calculations within density functional theory and/or model Hamiltonian approach, to identify the physics at play, followed by micromagnetic theory, Monte-Carlo and/or large-scale Atomistic Spin Dynamics simulations to elucidate the static and dynamic properties.
Such multiscale approach is useful in describing various aspects of condensed matter physics which include chiral spin structures in both real space e.g. skyrmion, domain-wall and momentum space e.g. topological insulators with non-trivial surface states, Rashba-Dresselhaus

systems, transverse transport phenomena via the spin Hall effect and/or the Edelstein effect, ultrashort light induced magnetization dynamics to name a few.

We have been working on these following areas:

Non-trivial topology in spin space: Skyrmion&anti-skyrmion

The recent information revolutions demand a steadily increasing data storage capacity with bits to be stored and processed on decreasing spatial and temporal scales. (Anti-)Skyrmions carrying nontrivial topology are particle-like solitons with spin states that appear in non-centrosymmetric bulk crystals and in ultrathin magnetic films deposited on heavy metal substrates. Recently, magnetic skyrmions are of intense interest: from a fundamental persp ective, they allow the unique interplay between topology, chiral magnetism and unconventional transport properties at the nanoscale to be investigated. Moreover, its small size, electric/magnetic field -controlled nucleation, detection and motion, preferably under ambient conditions, offer technological promises such as information storage based on more efficient skyrmion racetrack memory or logic technologies.

Spin-orbitronics

One of the primary requirements in this area is the conversion between charge an d spin transports for basic spintronics operations. The spin-dependent electron scattering due to the fundamental spin-orbit coupling produces a spin current from ausual electrical current and vice versa. Recently, we have seen a resurgence of interest in understanding such transport phenomena due to the new possibilities for manipulating magnetization on nanoscale. For example, if the spin current is injected into a magnetic material, the resulting torque has the potential to switch its magnetization even strikingly for an antiferromagnet; the resultant torque in ultrathin magnetic films can move a chiral domain walls or skyrmions, much more efficiently than any other known mechanism. We are interested in exploring the spin -charge conversions phenomena via the spin Hall Effect and/or the companion Edelstein effect and their inverse effects withinab initio theory.

Ultrafast magnetization dynamics

This area comprises fundamental aspects of magnetization dynamics preceded by ultrafast laser excitation in magnetically ordered materials as well as extending novel concepts of spintronics and magnetic recording towards ultrafast time -scale.

Such excitation of a material brings the material's electrons into a strongly out -of-equilibrium state that is within an ultrashort timescale engaged entangled dynamics between spin, orbital, and lattice degrees of freedom.The experimental capability of measuring ultrafast relaxation dynamics has led to the discovery of many unexpected phenomena: ultrafast demagnetization, change of magnetic anisotropy, generation of coherent magnetic precession etc.The theoretical frameworks which we are interested can describe such dynamical nonequilibrium phenomenon involving charge, spin, orbital, and lattice degrees of freedom interacting wi th such intensive, short radiation pulses.

Our teamis involved in developing and understanding theoretical models in above mentioned areas to cultivate new ideas which motivate experimentalist to set up new experiments or elucidate experimental observations.

**Dr. Sayantani Bhattacharyya, Reader-F**

In past one year, She is working with two Ph. D. students Parthajit Biswas, Anirban Dinda and two Integrated Ph. D she is am working on new perturbative techniques ('large dimension' expansion) to generate dynamical black hole solutions and they are comparing it with other existing techniques. Last year we had two publications in Journal of High Energy Physics and one arXiv preprint, which got published this year. In these projects we also collaborate with Yogesh Dandekar, post doctoral fellow in ICTS. The another parallel project that she was working on along with Anirban, Shuvayu, Nilay Kundu (faculty in IITK) and Jyotirmoy Bhattacharya (faculty in IITKgp) is about generalizing the concept of entropy current to hig her derivative theories of gravity. However, this project has not lead to any publication so far. Dr. Pratim Roy, post -doctoral fellow in our group, is independently working on the holographic aspects of complexity. Last year he has one publication.

**Publications (Journals):**

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108. As the co-author of 2 ATLAS papers: https://inspirehep.net/search?ln=en&ln=en&p=find+a+Prolay+Mal+and+cn+atlas+and+date+%3E03%2F2018&of=hb&action_search=Search&sf=earliestdate&so=d&rm=&rg=250&sc=0
109. Tunability of domain structure and magnonic spectra in antidot arrays of Heusler alloy Sougata Mallick, Sucheta Mondal, Takeshi Seki, Sourav Sahoo, Thomas Forrest, Francesco Maccherozzi, Zhenchao Wen, Saswati Barman, Anjan Barman, Koki Takanashi, and Subhankar Bedanta Phys. Rev. Applied (accepted)
110. Inverse Spin Hall Effect in Electron Beam Evaporated Topological Insulator $Bi_2Se_3$ Thin Film Braj B Singh, Sukanta K Jena, Manisha Samanta, Kanishka Biswas, Biswarup Satpati, Subhankar Bedanta Physica status solidi (RRL)–Rapid Research Letters 13, 1800492 (2018).
111. Tuning of magnetic properties by alternating the order of hard/soft bilayers with various thicknesses Sagarika Nayak, BrajBhusan Singh, Sougata Mallick and SubhankarBedanta J. Phys. D: Appl. Phys. 52, 305301 (2019).
112. 360 ° domain walls in magnetic thin films with uniaxial and random anisotropyN Chowdhury, W Kleemann, O Petracic, F Kronast, A Doran, A Scholl, S Cardoso, P Freitas, S BedantaPhysical Review B 98, 134440 (2018).
113. Relaxation dynamics in magnetic antidot lattice arrays of Co/Pt with perpendicular anisotropySougata Mallick, Swapna Sindhu Mishra, and SubhankarBedanta Scientific Reports 8, 11648 (2018).
114. Size and shape of skyrmions for variable Dzyaloshinskii-Moriya interaction and uniaxial anisotropyAroop Kumar Behera, Swapna Sindhu Mishra, Sougata Mallick, BrajBh usan Singh, and SubhankarBedantaJ. Phys. D : Appl. Phys. 51, 285001 (2018).
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130. Effect of ring topology in a stochastic model for Z-ring dynamics in bacteria, arXiv:1810.03371
131. Title: Anisotropic pressure of deconfined QCD matter in presence of strong magnetic field within one-loop approximation Authors: B. Karmakar, R. Ghosh, A. Bandyopadhyay, N. Haque, M.G. Mustafa Journal referenc e: Phys. Rev. D 99, 094002 (2019)
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155. Samir Kumar and Ritwick Das, "Refractive index sensing using a light trapping cavity: A theoretical study," Journal of Applied Physics, vol. 123, pp. 233103 (2018).
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**Conference/Workshop proceedings:**

1. "Multiplicity dependence of strangeness and hadronic resonance production in pp and p-Pb collisions with ALICE at the LHC" by Dr. Ajay Kumar Dash (for the AL ICE Collaboration).Proceedings of Quark Matter 2018, Nucl. Phys. A 982 (2019) 467 -470.
2. "Spin alignment measurements using vector mesons with ALICE detector at the LHC"by Dr. Ranbir Singh (for the ALICE Collaboration).Proceedings of Quark Matter 2018,Nuclea r Physics A 982 (2019) 515- 518.
3. Mesonic Resonance Production in p–Pb, Pb–Pb and Xe–Xe Collisions with ALICE at the LHC" by Mr. Dukhishyam Mallick (for the ALICE Collaboration). Proceedings of Hot Quark 2018 published in MDPI Proc. 10 (2019) no.1, 23; https://doi.org/10.3390/proceedings2019010023
4. "Thermodynamics and fluctuations-correlations of conserved charges in a hadron resonance gas model with attractive and repulsive interaction within S -matrix formalism" by Dr. Subhasis Samanta. Proceedings of Hot Quark 2018 published in MDPI Proc. 10 (2019) no.1, 25; https://doi.org/10.3390/proceedings2019010025
5. "Spin alignment measurements of K *0 vector mesons in ALICE at the LHC" by Mr. Sourav Kundu (for the ALICE Collaboration). Proceeding of DAE Symp. on High Energy Physics. To be published in Springer journal.
6. "Spin alignment of K*0 measured with ALICE detector at the LHC" by Dr. Ajay Kuma r Dash (for the ALICE Collaboration). Proceeding: DAE Symp. on Nucl. Phys. 63(2018)pp.936 -937.
7. "Energy and system size dependence of hadronic resonance production with ALICE at the LHC" by Mr. Dukhishyam Mallick (for the ALICE Collaboration) at the Interna tional symposium of nuclear physics (2018), BARC, Trombay, India December 10 -14, 2018. Proceeding: DAE Symp. Nucl. Phys. 63 (2018) pp.928-929.

8. "Feasibility of RPC Operation in Low Charge Production Mode for Its Use in High Rate Environment" by A. Jash, V. K. S. Kashyap and B. Mohanty. Proceeding: DAE Symp. Nucl. Phys. 63 (2018) pp.1058-1059.
9. "Neutron detection using liquid scintillator and study of polythene and borated polythene for neutron shielding" by V. K. S. Kashyap, S. Chandra, B. Pattnaik, R. Bhatta charyya and B. Mohanty.Proceeding: DAE Symp. Nucl. Phys. 63 (2018) pp.1098 -1099.
10. "Measurement of Higher Moments of net -particle Distributions in Au+Au collisions at √sNN = 54.4 GeV in STAR" by Mr. Ashish Pandav.Proceeding of DAE Symp. on High Energy Physics. To be published in Springer journal.
11. "32Si and 32P background estimate in CDMS II Silicon detectors" by Mr. Rik Bhattacharyya. Proceeding of DAE Symp. on High Energy Physics. To be published in Springer journal.
12. "Measurement of Higher Moments of net -particle Distributions in STAR" by Mr. Debasish Mallick (for the ALICE Collaboration).Proceeding of DAE Symp. on High Energy Physics. To be published in Springer journal.
13. Dr. Anamitra Mukherjee- Q-MAT conference at IISER Mohali, July 2018
14. Dr. Colin Benjamin:- Quantum Dynamics of Disordered Interacting Systems at ICTP, Italy from June 1115, 2018.
15. Group members attended ISM 2018 which was organized at IISER trivendrum. Deepali Mishra (PhD student) gave a talk based on work done by the group.
    Abstracts in ICMAGMA-2018, Dec 9-13, NISER Bhubaneswar:
16. A novel chiral spin texture: Antiferromagnetic skyrmionium Mona Minakshee Manjaree Bhukta, Abhilash Mishra, Gajanan Pradhan, Sougata Mallick, BrajBhusan Singh and Subhankar Bedanta
17. Quantifying Interfacial Dzyaloshinskii-Moriya Interaction on heavy metal/ferromagnet Brindaban Ojha, Sougata Mallick, Stefan Mattauch, Amir Syed Mohd, Sabine Pütter & Subhankar Bedanta
18. Size and shape of skyrmions for variable Dzyaloshinskii -Moriya interaction and uniaxial anisotropy Gajanan Pradhan, Aroop Kumar Behera, Swapna Sindhu Mishra, Sougata Mallick, BrajBhusan Singh, Subhankar Bedanta
19. Domain Structure and Magnetization Dynamics of L10 - FeNi Thin Films V. Thiruvengadam, B. B. Singh, T. Kojima, M. Mizuguichi, S. Bedanta
20. Fast Relaxation in Magnetic Antidot Lattice Arrays with Perpendicular Anisotropy Sougata Mallick, Swapna Sindhu Mishra and SubhankarBedanta
21. Effect of magnetic interfaces on magnetic properties in Fe/NiFe layers Sagarika Nayak, BrajBhusan Singh, Sudhansu Sekhar Das, SubhankarBedanta
22. Study of Damping Properties and Inverse Spin Hall Effect in LSMO Based System Pushpendra Gupta, BrajBhusan Singh, Koustuv Roy, SubhankarBedanta
23. Detection of spin Hall effect (SHE) using magneto -optic Kerr effect (MOKE) Koustuv Roy, BrajBhusan Singh, SubhankarBedanta
24. Inverse spin Hall effect in topological insulator Bi2Se3 thin films Braj B. Singh, Sukanta K. Jena, Manisha Samanta, Kanishka Biswas, BiswarupSatpati, and SubhankarBedanta
25. Domain structure of Co/Pt layers on flexible substrate Esita Pandey, Srijani Mallik, PurbashaSharangi, Palash Kumar Manna, SubhankarBedanta

26. Exchange bias in Fe/Ir20Mn80 bilayers: Role of spin glass like interface and 'bulk' antiferromagnetic spins Sagarika Nayak, Palash K. Manna, Vijayabaskaran Thiruvengadam, BrajBhusan Singh, SubhankarBedanta
27. Dr. Kartik Senapati- Indo-Singapore physics symposium, Puri (2019)
28. Dr. Chethan N Gowdegere- Indian Strings Meet Trivandrum December 2018
29. Dr. Ashis K. Nandy, DAE-SSPS 2018, 18-22 December, Hisar, Haryana India.
30. Wojciech Florkowski, Bengt Friman, Amaresh Jaiswal and Enrico Speranza, "Fluid dynamics of relativistic spin-polarized media" Acta Physica Polonica B Supplements 11 (2018) 507 [arXiv:1810.01709].
31. Ritwick Das, "Tamm plasmon polaritons in periodic and aperiodic photonic crystals" at International Symposium on Optics (Organized by The Optical Society of India or OSI) at I.I.T. Kanpur, September 2018
32. Ritwick Das, "Optical Parametric Oscillators: A road to reach inaccessible spectral bands" at DAE- BRNS National Laser symposium (NLS) at RRCAT Indore, December 2018

**Conferences /Workshop/Meeting organized:**

Prof. Bedangadas Mohanty
A symposium on Heavy-ion physics at FAIR, RHIC and LHC facilities
It was organized at NISER from June 18, 2018 to June 19, 2018. The aim of the sy mposium was to

1. bring together people from heavy ion physics experiments at FAIR, RHIC, LHC facilities where India is a member
2. discuss the various developments and future prospects in the field in both theory and experiment

There was a special session dedicate to Prof. Tapan Kumar Nayak for his contribution to heavy ion physics in India.

ALICE-STAR-India Collaboration Meeting 2018-2019
The meeting was held from September 17, 2018 to September 20, 2018. This meeting was a part of regular meetings held every year to discuss the physics results, analysis details, detector and upgrade efforts, experimental site visits, budget admission of new institutes and matters related to the ALICE and STAR experiments from the Indian perspective.

Dr. Colin Benjamin- Organized colloquium by Prof. M. P. Das on "Boson Condensation without and with Confinements", Dec. 10, 2018 in SPS, NISER.

Dr. Colin Benjamin- Organized seminar by Prof. M. P. Das on "Anomalies in Quantised Conductances in Quasi- 1D Electronic Systems", Dec. 10, 2018 in SPS, NISER.

Dr. Colin Benjamin- Delivered a seminar on "Understanding Game theory using tools from statistical mechanics and quantum physics", Jan. 11, 2019 in SPS, NISER.

Dr. Ajaya K Nayak Organized and Co -Convener of ICMAGMA conference held at NISER, 2018.

Dr. Yogesh Srivastava, String theory group organized a mini conference on Recent topics in String theory from March 28-31, 2019. About 40 participants attended in all and there were participants from all over India and some from abroad. C onference was attended by both Strong theorists and cosmologists.

Dr. Subhankar Bedanta organised and convenor of theInternational Conference on Magnetic Materials and Applications (ICMAGMA - 2018) held at NISER Bhubaneswar during Dec 9-13, 2018.

Dr. Ashis K. Nandy, "Forum on Quntum Materials" 2019 meet held at NISER

Dr. Nishikanta Khandai-Introductory School on Galaxy Formation (jointly with IUCAA Pune)

Dr. Ritwick Das-Topical Meeting on Advances in Photonics (TMAP) at NISER during 29th -30th March 2019

**Projects from non-DAE schemes:**

Research Project title: "J. C. Bose Fellowship"
PI: Prof. Sudhakar Panda
Funding Agency: SERB-Department of Science and Technology, Govt. of India
Sanctioned:amount:Rs.75,00,000
Duration: 2017-2022

Research Project title: "J. C. Bose Fellowship"
PI: Prof. Bedangadas Mohanty
Funding Agency: SERB-Department of Science and Technology, Govt. of India
Sanctioned:amount:Rs.75,00,000
Duration: 2017-2022

Dr. Colin Benjamin: SCIENCE & ENGINEERING RESEARCH BOARD, DST, Government of India, MATRICS grant on "Nash equilibrium versus Pareto optimality in NPlayer games", Grant No. MTR/2018/000070 from Mar. 2019 Mar. 2022.

Dr. Colin Benjamin- DST SERB Project, July 2016July 2020: "Nonlocal correlations in mesoscopic superconducting junctions". PI: Colin Benjamin,
Theoretical project with a budget of around 25 Lakhs which includes funds for recruiting a Research Associate.

Dr. Colin Benjamin- ICTP Research stay, JuneJuly 2018 on "Mesoscopic Superconductivity", Host: ICTP, Italy, in cludes funds for travel and subsistence.

Early career research award
PI: Dr. Tuhin Ghosh
Title: Modelling and simulation of polarized dust emission using the Planck data and external templates.
Source of funding: SERB DST
Budget: Rs. 44, 93, 059/ (2019-2022)

(i) Dr. Ajaya K Nayak: - Max Planck-India partner group project
Title: Room temperature magnetic skyrmions and the study of their current driven motion for potential applications in racetrack memory devices.
Source of funding: Max Planck Society, Germany
Budget: 20,000 euro per year (Total: 60000 euro in 3 years, 2017 -2020).

(ii) Dr. Ajaya K Nayak : - Ramanujan Fellowship
Title: Designing Magnetic Anisotropy for Spintronics
Source of funding: DST/SERB
Budget: Rs. 7 lakhs per year (Total: 35 lakhs in 5 years, 2017- 2022). In addition, overhead of Rs. 3 lakhs in 5 years.

(iii) Dr. Ajaya K Nayak : - Early career research award
Title: Designing novel magnetic materials for exploring skyrmions at room temperature
Source of funding: DST
Budget: Rs. 39, 13056/ (2018-2021)

(iv) Dr. Ajaya K Nayak: - DST-Nanomission
Title: In-situ low temperature imaging of magnetic nano-structures using Lorentz Transmission Electron Microscopy
Source of funding: DST
Budget: Rs. 86,55,200/ (2018-2021)

Dr. Sanjay K Swain: - SR/MF/PS-01/2016-NISER/G Dt: 28th March, 2019 (1.14Crore)

Dr. Prolay K Mal: - Ramanujan Fellowship (2013-18) – SERB, DST
Dr. Prolay K Mal: - HEP Triggering Techniques (2017 -2020) – SERB, DST
Dr. Prolay K Mal: - Indo-Fench HEP collaboration (2015-2018) -- CEFIPRA, France

Ferromagnetic-Semiconductor heterostructures for magnetic field sensing and optoelectronic applications (DST-Nanomission)
PI: S. Bedanta, Financial Support sanctioned: ~Rs 62.41 lakhs
(This project is being continued since 2017)

Electric field induced spin wave spectra in multiferroic antidot lattice arrays (India-Poland bilateral proposal via DST)
PI: S. Bedanta, Financial Support sanctioned: ~Rs 17.2 lakhs
(This project is being continued since 2015)

Creating magnetic interface in non-magnetic organic thin films for spintronic applications (DST-SERB)
PI: S. Bedanta, Financial Support sanctioned ~ Rs 60.75 lakhs
(This project is being continued since 2018)

Tuning the interfacial Dzyaloshinskii-Moriya interaction in ultrathin magnetic films: toward the stabilization of skyrmions in spintronics devices (Indo-French CEFIPRA project)

PI: S. Bedanta, Financial Support sanctioned ~ Rs 73.8 lakhs
(This project is being continued since 2018)

62.9 Lakhs from DST SERB, for project entitled "Superconductor-exchange Spring-Superconductor Junctions for tunable spin-triplet supercurrent devices" from DST-SERB as PI S. Bedanta

Dr. Joydeep Bhattacharjee SR/NM/NS-1026/2011
Theoretical exploration of optical properties and photovoltaic application possibilities o f carbon basednanostructures

Dr. Nishikanta Khandai- Ramanujan Fellowship - ongoing

**Projects from DAE Sources: NIL**

**Talks (Invited and contributory):**

1. "Multiplicity dependence of strangeness and hadronic resonance production in pp and p-Pb collisions with ALICE at the LHC" by Dr. Ajay Kumar Dash (for the ALICE Collaboration) at The 27th International Conference on Ultrarelativistic Nucleus-Nucleus Collisions, Venezia, Italy, May 13-19, 2018.
2. "Spin alignment measurements using vector mesons with ALICE dete ctor at the LHC"by Dr. Ranbir Singh (for the ALICE Collaboration) at The 27th International Conference on Ultrarelativistic Nucleus-Nucleus Collisions, Venezia, Italy, May 13-19, 2018.
3. Spin alignment measurements of K*0 vector mesons in ALICE at the LHC" b y Mr. Sourav Kundu (for the ALICE Collaboration)" at XXXIX International Conference on High Energy Physics (ICHEP 2018), Coex, Seoul, Korea, July 4-11, 2018.
4. "Mesonic Resonance Production in p–Pb, Pb–Pb and Xe–Xe Collisions with ALICE at the LHC" by Mr. D ukhishyam Mallick (for the ALICE Collaboration) at 8th Workshop for young scientists on the physics of ultrarelativistic nucleus-nucleus collisions (Hot Quarks 2018), De Krim on Texel Island in the Netherlands, September 7-14, 2018.
5. "Thermodynamics and fluctuations-correlations of conserved charges in a hadron resonance gas model with attractive and repulsive interaction within S-matrix formalism" by Dr. Subhasis Samanta at 8th Workshop for young scientists on the physics of ultrarelativistic nucleus-nucleus collisions (Hot Quarks 2018), De Krim on Texel Island in the Netherlands, September 7-14, 2018.
6. Light flavour hadron production in Xe-Xe collisions at √sNN= 5.44 TeV with ALICE at the LHC" by Mr. Sourav Kundu (for the ALICE Collaboration)" at The 7th Asian Triangle Heavy-Ion Conference (ATHIC 2018), University of Science and Technology of China (USTC), Hefei, China, November 3-6, 2018.
7. "Effect of limited statistics on higher order cumulants measurement in heavy -ion collision experiments" by Mr. Debasis h Mallick (for the ALICE Collaboration)" at The 7th Asian Triangle Heavy-Ion Conference (ATHIC 2018), University of Science and Technology of China (USTC), Hefei, China, November 3-6, 2018.

8. "Spin alignment measurements of K *0 vector mesons in ALICE at th e LHC" by Mr. Sourav Kundu (for the ALICE Collaboration)" at the DAE symposium on high energy physics (2018), IIT Madras, India, December 10-14, 2018.
9. "Measurement of Higher Moments of net-particle Distributions in Au+Au collisions at √sNN = 54.4 GeV in STAR" by Mr. Ashish Pandav at the DAE symposium on high energy physics (2018), IIT Madras, India, December 10-14, 2018.
10. "32Si and 32P background estimate in CDMS II Silicon detectors" byMr. Rik Bhattacharyya at the DAE symposium on high energy physics (2018), IIT Madras, India, December 10-14, 2018.
11. "Interacting hadron resonance gas mode" by Dr. Subhasis Samanta at A symposium on Heavy-ion physics at FAIR, RHIC and LHC facilities, NISER, Jatni, Odisha, June 18-19, 2018.
12. "Fluctuations of conserved charges in Au-Au collisions with CBM" by Dr. Ranbir Singh at The 32nd CBM collaboration meeting, GSI, Darmstadt, Germany, October 1-5, 2018.
13. "Feasibility study of RPC operation in low gain mode" by Dr. Varchaswi K S Kashyap at The 32nd CBM collaboration meeting, GSI, Darmstadt, Germany, October 1-5, 2018.
14. Dr. Anamitra Mukherjee- IACS Kolkata, June 2018
15. Dr. Anamitra Mukherjee -IISER Mohali, July 2018
16. Dr. Anamitra Mukherjee- IACS Kolkata, Dec 2018
17. Dr. Anamitra Mukherjee- TIFR Hyderabad, Feb 2019
18. Dr. Tuhin Ghosh, Invi ted Speaker atEcoleNormaleSuperieur Paris.
19. Dr. Tuhin Ghosh, Contributed talk at Cosmology the next decade workshop at ICTS Bangalore.
20. Dr. Tuhin Ghosh, Contributed talk at SAC THz detector technology meeting at SAC Ahmedabad.
21. Dr. Tuhin Ghosh, Invited Speak er at Frontiers in 21 cm Cosmology workshop at Kodaikanal, Bangalore.
22. Dr. Tuhin Ghosh, Invited Seminar at IIT BHU.
23. Dr. Tuhin Ghosh, Invited Speaker atRAD workshop NISER.
24. Dr. Tuhin Ghosh, Contributed talk at PASIPHAE collaboration meeting IUCAA Pune.
25. Dr. Ajaya K Nayak:- "Physics of Strongly Correlated Electron Systems" conference, IIT Delhi, 2019.
26. Dr. Ajaya K Nayak First Indian Materials Conclave", IIScBangalore, 2019
27. Dr. Ajaya K Nayak DAE SSPS, Hisar, 2018
28. Dr. Ajaya K Nayak Invited talk in ICEE conference , Bangalore, 2018
29. Dr. Ajaya K Nayak Invited talk in EMSI conference, Bhubaneswar, 2018.
30. Dr. Ajaya K Nayak Invited talk in "Physics of Strongly Correlated Electron Systems" conference, IIT Delhi, 2019.
31. Dr. Ajaya K Nayak Invited talk in "First Indian Materia ls Conclave", IIScBangalore, 2019.
32. Dr. Ajaya K Nayak Invited talk in DAE SSPS, Hisar, 2018
33. Dr. Ajaya K Nayak Invited talk in ICEE conference, Bangalore, 2018.
34. Dr. Ajaya K Nayak Invited talk in EMSI conference, Bhubaneswar, 2018
35. Dr. Sanjay K Swain: - Invited talk at Lake Louise Winter Conference, Canada
36. Dr.Sanjay K Swain "Highlights of Top Quark Properties" – HQL2018, Yamagata, Japan, May 27-June 1, 2018

37. Dr.Sanjay K Swain "Charged Higgs Searches in CMS" – Theoretical Workshop on SUSY - Is SUSY still the best bunker to hide in?, IISc., Bangalore, May 10 -13, 2018
38. Dr. Subhankar Bedanta-Physics Seminar at Institute of Nanoscience and Technology (INST), Chandigarh Title: Manipulating and/or creating magnetism by architecture and interface
39. Dr. Subhankar Bedanta Physics Seminar at Delhi University, New Delhi: Nanomagnetism in dots and antidot lattices
40. Dr. Subhankar Bedanta Physics Seminar at IIT Madras Magnetism at the interfaces and in nanostructures
41. Invited talk at ForschungszentrumJuelich, Germany Magnetism due to and at interfaces
42. Dr. Subhankar Bedanta Invited lecture at Laboratory of Solids of University of Paris -Sued, France Interface induced Magnetism and spin pumping
43. Dr. Subhankar Bedanta Invited talk at Meeting on Condensed Matter Physics held at NISER entitled as "Magnetization static and dynamics in dots and antidot lattices".
44. Dr. Subhankar Bedanta Invited talk at International conference on Microscopy with entitled as "Magnetic domain imaging via magneto-optic Kerr microscopy"
45. Dr. Subhankar Bedanta Invited talk at "Discussion meeting on Recent Advances in Magnetism(DMRAM-2019)" held at IIT Mandi
46. Dr. Subhankar Bedanta Magnetization Reversal in magnetic dot and antidot lattices
47. Dr. Subhankar Bedanta Contributory talk at International Conference on Magnet ism (Intermag 2018)" held at Singapore entitled as "Spinterface induced magnetic properties in Fe or Co thin films"
48. Dr. Subhankar Bedanta Invited talk at the Indo-Singapore meeting organized by Institute of Physics, Bhubaneswar in March 2019. "Inverse spin Hall effect in electron bean evaporated topological insulator Bi2Se3 thin film"
49. Dr. Subhankar Bedanta Invited lecture at the 2nd Annual meeting on "Physics of Strongly correlated electron systems" held at IIT Delhi entitled as "Inverse Spin Hall Effect in Electron Beam Evaporated Topological Insulator Bi2Se3Thin Film".
50. Ferromagnetic domain walls as singlet-to-triplet supercurrent converters ; Presented at Indo-Singapore physics symposium, 2019, Puri
51. Dr. Victor Roy-One particle distribution and shear viscosity: a relaxation time approach (talk given in MIAPP, August 2018, Munich, Germany.)
52. Dr. Victor Roy Title: Band topology, disorder and light
    Place: Saha Institute of Nuclear Physics, Kolkata, India
    Date: 6thNovember, 2018
53. Dr. Najmul Haque-Title :Recent progress in Hard Thermal Loop perturbation theory Place: ICTS, Bangalore□Date: 15. 04. 2019
54. Dr. Joydeep Bhattacharjee-XXXI IUPAP CCP, 2019, Ch. Univ. of HK (Cont.)
55. Dr. Joydeep Bhattacharjee YIMQCMT 2018 , S N Bose Centre of Basic Sciences, Kolkata. (Invited)
56. Prof. Sudhakar Panda- "Science and Society" at Regional Institute of Education (RIE), Bhubaneswar
57. Prof. Sudhakar Panda "Quest for unified Theory" at Institute of Life Sciences (ILS), Bhubaneswar

58. Invited talk by Ashok K Mohapatra at 3rd International workshop on Ultracold Rydberg Physics held at Recife, Brazil during Dec 2 - 4, 2018
59. Invited talk by Ashok K Mohapatra at International conference on Dynamics of ultra - cold systems with embedded highly excited Rydberg atoms held at IISER Bhopal during October 22 - 24, 2018
60. Invited talk by Ashok K Mohapatra at the workshop on "Giant interactions in Rydberg Systems" held at University of Hamburg, Germany during July 4 - 6, 2018
61. Invited talk by Ashok K Mohapatra on "Study of Rydberg bl ockade in Thermal vapour" at Universitaet Stuttgart, Germany on 28th June, 2018
62. Invited talk by Ashok K Mohapatra on "Study of Geometric Phase in classical coupled oscillator" at Universitaet Stuttgart, Germany on 13th July, 2018
63. Invited talk by Sushree S Sahoo on "Mirrorless optical parametric oscillator inside an all-optical wave-guide" at TAMP-2019 held during March 29 -30, 2019 at NISER Bhubaneswar
64. Invited talk by Dushmanta Kara on "Study of Rydberg blockade in thermal atomic vapour" at theInternational Workshop on Strongly interacting, Open many -body systems with the emphasis on the Rydberg atom physics held during Sept 30 - Oct 03, 2018 at Heraklion, Crete, Greece
65. Invited talk byDushmanta Kara on "Development of NISER OSA student chapter" at OSA students leadership conference held during Sept 14 - 15, 2018 at Washington DC, USA
66. Conference attended by Dushmanta Kara at OSA Frontiers in Optics Laser Sciences APS/DLS held during Sept 16 - 19, 2018 at Washington DC, USA
67. Poster presentation by Dushmanta Kara on "Observation of Rydberg blockade in thermal atomic vapor" at TAMP -2019 held during March 29 -30, 2019 at NISER Bhubaneswar
68. Poster presentation by Tanim Firdoshi on "Study of four -photon excitation to Rydberg state in thermal rubidium vapour" at TAMP -2019 held during March 29 -30, 2019 at NISER Bhubaneswar
69. Dr. Nishikanta Khandai - (invited speaker) - Conference on Universe After The First 200 Million Years, Presidency University, Kolkata
    Title - Simulations of the Post-EoR HI Signal
70. Dr. Nishikanta Khandai (contributed talk) - Workshop on Galaxies in Absorption, IUCAA Pune
    Title - The Large Scale Clustering of the LyÆorest
71. Dr. Nishikanta Khandai (contributed talk) - Ramanujan Fellows Conclave, SASTRA University, Thanjavur
    Title - Cosmological Hydrodynamical Simulations of Galaxy Formation
72. Dr. Nishikanta Khandai (invited seminar) - IISER Mohali,
    Title - Revisiting The HI Mass Function
73. Dr. Nishikanta Khandai-(workshop speaker/tutor hands-on session) - Introductory School on Galaxy Formation, NISER, Bhubaneswar
    Title - N-Body Techniques for Self -Gravitating Systems
74. Dr. Nishikanta Khandai "Anisotropic escape mechanism and elliptic flow of bottomonia", 3rd Heavy Flavour Meet, March 19, 2019, IIT Indore, India. (Invited).
75. Dr. Nishikanta Khandai "Analytical so lutions and attractors of higher-order viscous hydrodynamics for Bjorken flow", International Workshop XLVII on Gross Properties of

Nuclei and Nuclear Excitations, January 18, 2019, Hirschegg, Kleinwalsertal, Austria. (Contributory).

76. Ritwick Das, "Tamm plasmon polaritons in periodic and aperiodic photonic crystals" at International Symposium on Optics (Organized by The Optical Society of India or OSI) at I.I.T. Kanpur, September 2018
77. Ritwick Das, "Optical Parametric Oscillators: A road to reach inaccessible spectral bands" at DAE- BRNS National Laser symposium (NLS) at RRCAT Indore, December 2018
78. R.R. Sahoo, M.K. Shukla and Ritwick Das, "Green fiber laser pumped congruently-grown LiTaO3 optical parametric oscillator" at PHOTONICS -2018 at I.I.T. Delhi, Decemb er 2018
79. Ritwick Das and M.K. Shukla, "Single-frequency optical parametric oscillators" at Conference on Plasmonics, Metamaterials and Photonics at J.I.I.T. Noida, February 2019

**Poster presentations:**

1. "Measurement of K*(892)0 and $\phi$(1020) production in p-Pb collisions at $\sqrt{s_{NN}}$ = 8.16 TeV with ALICE at the LHC" by Mr. Dukhishyam Mallick (for the ALICE Collaboration) at The 27th International Conference on Ultrarelativistic Nucleus-Nucleus Collisions, Venezia, Italy, May 13-19, 2018.
2. "Energy and system size dependence of hadronic resonance production with ALICE at the LHC" by Mr. Dukhishyam Mallick (for the ALICE Collaboration) at the International symposium of nuclear physics (2018), BARC, Trombay, India December 10 -14, 2018.
3. "Measurement of Higher Moments of net-particle Distributions in STAR" by Mr. Debasish Mallick (for the ALICE Collaboration)" at the DAE symposium on high energy physics (2018), IIT Madras, India, December 10-14, 2018.
4. "Spin alignment of K*0 measured with ALICE detector at the LHC" by D r. Ajay Kumar Dash (for the ALICE Collaboration) at the International symposium of nuclear physics (2018), BARC, Trombay, India, December 10 -14, 2018.
5. "Feasibility of RPC Operation in Low Charge Production Mode for Its Use in High Rate Environment" by A. Jash, V. K. S. Kashyap and B. Mohanty, at the International symposium of nuclear physics (2018), BARC, Trombay, India December 10 -14, 2018.
6. "Neutron detection using liquid scintillator and study of polythene and borated polythene for neutron shielding" by V. K. S. Kashyap, S. Chandra, B. Pattnaik, R. Bhattacharyya and B. Mohanty at the International symposium of nuclear physics (2018), BARC, Trombay, India December 10-14, 2018.

**Recognitions:**

1. Prof. Sudhakar Panda- Recipient of Dr.Harekrushna Mahatab Samman on November 21, 2018 presented by Dr. Harekrushna Mahatab Jayanti Committee, Bhubaneswar.
2. Prof. Sudhakar Panda- Recipient of Dr. Basudev Kar Memorial Vigyan Bidwatta Samman on December 20, 2018 presented by DrBasudev Kar Memorial Foundation, Cuttack.
3. Prof. Sudhakar Panda- Recipient of Pratibha Shree Samman 2018 presented by Pratibha Shree Paribar, Balasore.

4. Prof. Sudhakar Panda- Recipient of Odisha Bigyan 'O' Paribesh Congress Award 2018 presented for his lifetime academic achievements by Orissa Envir onmental Society, Bhubaneswar.
5. Prof. Bedangadas Mohanty joined the Editorial Board of International Journal of Modern Physics – E
6. Dr. Colin Benjamin Awarded ICTP Research stay JUNE -JULY 2018, Host: ICTP, TRIESTE, ITALY.
7. Dr. Colin Benjamin's recent research on seeing a genuine Parrondo's paradox with quantum walks, published in Royal Society Open Science and EPL (Euro Physics Letters) has been featured in Live Science, a website devoted to the science geek, see Weird Paradox Says 2 Losses Equals a Win. And It Could Lead to Fast Quantum Computers by Marcus Woo.
8. Dr. Colin Benjamin's recent article on "Playing a true Parrondo's game with a three -state coin on a quantum walk" published in EPL (Europhysics Letters) has been featured in PHYS.ORG, see Parrondo's paradox with a three -sided coin by Lisa Zyga, Phys.org feature.
9. Dr. Colin Benjamin's recent article on "Triggers for cooperative behavior in the thermodynamic limit: a case study in Public goods game", published in Chaos: An Interdisciplinary Journal of Nonlinear Science has been selected as a featured article in Chaos.
10. Dr. Tuhin Ghosh received 2018 Gruber Cosmology Prize as a member of Planck Team.
11. Dr. Tuhin Ghosh received 2018 RAS Group Achievement Award as a member of Planck Team.
12. Dr. Tuhin Ghosh got selected for IUCAA visiting associateship program.
13. Dr. Ajaya K Nayak: - Ramanujam Fellowsh
14. Dr. Ajaya K Nayak: - Early Career Research Award
15. Dr. Subhankar Bedanta awarded the DAAD research fellow to visit ForschungszentrumJuelich, Germany for 2 months in summer 2018.
16. Dr. Najmul Haque appointed as Adjunct professor in IIT Bhubaneswar in the Autumn semester 2018-19 and taught a 20 hours course on Mathematical Physics in IIT Bhubaneswar.

**Doctoral degree awarded to Ph. D. Students:**

1. Arjun Mani, under Dr. Colin Benjamin was awarded Ph. D in Physical Sciences from HBNI in Dec. 2018. Currently he is Postdoctoral Research Associate at Information Sciences Institute, University of Southern California, Los Angeles, USA.
2. Dr Koushik Mandal under Dr. Sanjay K Swain
3. Sougata Mallick under Dr. Subhankar Bedanta

Thesis title: Static and Dynamic Magnetization in Magnetic Antidot Lattice Arrays

4. Srijani Mallik under Dr. Subhankar Bedanta

Thesis title: Spinterface with Fullerene

5. Sameer Kumar under Dr. Ritwick Das
6. Mukesh Shukla under Dr. Ritwick Das

7. Arup Bhowmik under Dr. Ashok Mohapatra
8. Rita Maji under Dr. Joydeep Bhattacharjee
9. Mukesh Kumar Shukla, under Dr. Ritwick Das - Thesis title: High power continuous wave tunable laser sources from visible to Mid-IR based on Optical parametric oscillators
10. Samir Kumar, under Dr. Ritwick Das -Thesis title: Linear and Nonlinear Optical Effects in Sub-wavelength Structures

**Outreach Program:**

1. Dr. Subhankar Bedanta-Chief guest at Science day celebration at Berhampur University, 2019. Gave an invited lecture "Magnetic Nanotechnology - Past, Present and Future"
2. Dr. Subhankar Bedanta-Chief guest at Science day celebration at Centurion University, 2019. Gave an invited lecture "Magnetic Nanotechnology - Past, Present and Future"
3. Dr. Joydeep Bhattacharjee-Member of NISER out-reach committee which coordinates Vigyan Pratibha program for senior school kids conducted by HBCSE Mumbai.
4. Dr. Nishikanata Khandai-Introductory School on Galaxy Formation (jointly with IUCAA Pune)

**Major research facilities added in School of Physical Sciences:**

1. CMS tracker Lab established at NISER under Dr. Sanjay Kumar Swain
2. Dielectric spectroscopy set-up for temperature range 10 to 300 K and frequency up to 32 MHz under Dr. Subhankar Bedanta
3. Probe station with 2 rf probes Dr. Subhankar Bedanta
4. High Performance Computing facility "Kalinga" to School of Physical Sciences NISER. Kalinga is 1024 core computation facility used for computation in condensed matter physics, high energy physics and astrophysics.
5. Xanadu Server - Funded by Ramanujan Fellowship - Currently used by students/faculty from NISER, Presidency and visiting project students.

**SCHOOL OF HUMANITIES AND SOCIAL SCIENCES**

**Dr. Pranaya Kumar Swain, Reader F**
**Title of the Research:**

- Public Policy and Governance, Social Development with specific focus on Health, Education and Livelihood, Science-Society Interface and Contemporary Social Issues

**Brief introduction of updated research work:**

- Public Policy and Governance: public policy research aims at facilitating a better understanding of issues related to governance and public affairs and bridging the gap by offering to analyse the actual implementation of policies by drawing upon comparative and international perspectives in public policy.
- Social Development: with specific focus on Health, Education and Livelihood as they form three basic pillars of development. Currently the group is working on various aspects of Human-elephant conflict, elementary education, gender issues related to

access to health services, environmental issues like solid waste management, etc. The aim is also to enhance our knowledge of development sector through independent and critical research.

- Science Society Interface: Historically science has been steadily contributing in terms of shaping human thinking. As Herbert Spencer puts it Society has evolved through the three stages of evolution, namely theological, metaphysical and positive. Rational thinking and problem solving are two of the major hallmarks of science. However, there is a need to continuously study the interactions between science and society that are designed to maintain the balance between scientific quality, political legitimacy and societal relevance.
- Contemporary Social Issues: In order to achieve effective solutions to societal problems that involve science and technology, there is a need to understand the changing priorities and the patterns in social life. With technology driven life-style gripping the young generation, the resultant social issues must be addressed with fair amount of details. Our aim is to deep dive into the social transformation due to digital life style and offer valuable insights.

**Dr. Joe Varghese Yeldho, Reader F**
**Title of the Research: Phenomenology of Sound in Harlem Narratives**
**Brief introduction of updated research work:**

- The research focuses on the figural experience of sound and the ways in which it contributes to our understanding of an urban landscape. In this project the primary trope used is that of 'dwelling,' as discussed by Martin Heidegger. The narratives selected for the work span cultural text's produced in the Harlem geography from the 1920's to 1940's. A major point of interest is to look into how the experie nce of listening to sound dovetails into the experience of dwelling in urban locations.

**Dr. Amarjeet Nayak, Reader F**
**Title of the Research: Speculative Fiction Studies, Postcolonial Studies**

**Brief introduction of updated research work:**

- Speculative Fiction Studies reflects on the genre's focus on individual longings, fears as well as larger socio-political concerns. Whether it is prophetic or satirical, speculative fiction is rarely escapist, and it often holds a mirror to human society, of not just th e present, but a possible future as well. The current South Asian speculative fiction often engages with its colonial histories and offers an enticing possibility for being looked at using a postcolonial lens.

**Dr. Amarendra Das, Reader F**
**Title of the Research: Depreciation of Capital Due to Natural Disaster and Adjusted Net Domestic Product**
**Brief introduction of updated research work:**

- Per capita Net Domestic Product is used as a measure of average standard of living of a nation. Conventional measurement of Net Domestic Product (NDP) accounts for the depreciation of physical capital due to its wearing and tearing. It does not include the depreciation of physical capital due to natural disaster. Due to climate change, the

frequency of natural disasters has increased in recent years. Some countries/states face more natural disasters than others. It causes huge damage to the physical infrastructure of the state and impairs the overall capability. It also puts severe fiscal burden on the state to keep the welfare of the people at the same level. Therefore, the depreciation of physical capital due to natural disaster should be taken into consideration for calculating the Net Domestic Product for the country and states. My current research work seeks to develop a new methodology for calculating adjusted NDP by factoring in the depreciation of physical capital due to natural disaster.

**Dr. Debashis Pattanaik, Assistant Professor**
**Title of the Research:**

- Primary areas of interest are in the fields of Social network analysis, Health, Care & Disability, Social aspects of ICT

**Brief introduction of updated research work:**

- Social network analysis: It focuses on understanding of individual outcomes of social processes through flow of resources across network in a given social structure. It offers an understanding of the responsive of a system towards individual or system outcomes. Currently the research group is working on network effects on care of terminally ill patients.
- Health, care and disability: Health care, as a component of social life is a major need of patients across the world. The research focuses on understanding of the medical processes in caring at an institutional setting along with network organization of care.
- Social aspects of ICT: ICT is one of the development pillars. In today's world it is tool for learning, employment and amusement. In the emerging context of eSports today there is growing concern about its professionalization, governance and socio-technical issues. The research group focuses on professional aspects of eSports and socio-cultural ramifications arising in the field of computer and electronic gaming system.

**Dr. Rooplekha Khuntia, Assistant Professor**
**Title of the Research:**

- A Behavioural Profile of Autism Spectrum Disorder and Exploring Social Interaction Pattern of Children with Autism Spectrum Disorder

**Brief introduction of updated research work:**

- Studies worldwide indicate an increase in the prevalence of Autism. As per the INCLEN survey, 2014, 2.3 million children in India are affected by Autism. Childhood Autism is a neurodevelopmental disorder and its early detection is crucial for any intervention to be effective. Though standardized diagnostic tool developed in India is available, it can be used only by trained professionals. This research focuses on developing a screening tool that will help lay persons to sense the behavioural indicators of ASD at a very early stage. It also studies, the social interaction pattern of such children with their parents and siblings and how such interactions impact the progression and regression of this disorder.

## Publications

**Dr. Pranaya Kumar Swain, Reader F**

- **Swain, P.K. 2019, "**Domestication of Jagannath Temple rituals in Odia Households: A Sociological Understanding of the Pantheism", in *Bonding with the Lord: Jagannath, Popular Culture and Community Formation,* Eds Jyotirmaya Tripathy and Uwe Skoda, Bloomsbury Publishing, London/New Delhi, pp xx- xx (forthcoming)

**Dr. Amarjeet Nayak, Reader F**

- Fernandez, Jasmine, Upendra, C., and Amarjeet Nayak. "A New Critical Notice of Robin Cook's Medical Thriller *Coma*", *SOCRATES*. Vol. 6, no. 3 and 4, 2019, pp. 1-26, DOI: 10.5958/2347-6869.2018.00012.2

**Dr. Amarendra Das, Reader F**

- Das Amarendra and V. Santhakumar (2018) Education of Adivasis in India: Relooking the Language Barrier. Orissa Economic Journal, pp. 38-58.

**Awards and Honours**

**Conferences and Seminars**

**Dr. Pranaya Kumar Swain, Reader F**

- Gender based Marginalization and the Social Context of Risk Perception: Everyday Life in University Campus, **44th All India Sociological Conference, St. Philomena's College, Mysuru**, 27-29 December 2018
- The rituals of Jagannath temple and Odia Households: a reverse pantheistic understanding of the Metonymy, Conference-cum-workshop on Bonding with the Lord: Uses of Jagannath in Community Formation and Popular Culture in and beyond Odisha, **IIT Madras**, Chennai, 29-30 September 2018
- Movement for Strengthening Science Based Higher Education and Research: The Case of NISER and IISERs in India, **XIX World Congress of Sociology, International Sociological Association, Toronto** , Canada, 15-21 July 2018

**Dr. Joe Varghese Yeldho, Reader F**

- "Reading Harlem: Claude McKay, Ann Petry and the aesthetic of dwelling." Presented at 75th SCMLA Conference (October, 2018), San Antonio, Texas.

**Dr. Amarjeet Nayak, Reader F**

- "Man, Nature and Island: A Close Reading of Pankaj Sekhsaria's *The Last Wave*" presented at "International Conference on Multidisciplinary Approaches to Island Studies", 14th – 17th May 2018, Port Blair, Andaman and Nicobar Island.

**Dr. Amarendra Das, Reader F**

- Incomplete and inappropriate teaching curriculum for achieving sustainable development in India in CIES 2019 conference held at **Hyatt Regency,** San Francisco, USA, during April 14-18, 2019.
- Why are Developed countries reversing their doctrine of free trade? In 51st Annual Conference of Orissa Economics Association, Kendrapara autonomous college, Kendrapara, Odisha.

- Schooling of Scheduled Tribes in India: Lessons from the Indigenous People of Brazil (With Prof V. Santhakumar) at CIES 2018 conference, Hil ton Reforma, Mexico City, Mexico, During March 25-29, 2018.
- Schooling of Scheduled Tribes in Odisha: Lessons from the Indigenous People of Brazil in the Silver Jubilee conference of Odisha Gabeshana Chakra held at NCDS Bhubaneswar during January 27-28, 2018.

## Invited Talks

**Dr. Pranaya Kumar Swain, Reader F**

- Animal Welfare and Societal Impact, at the Orientation Workshop on Laboratory Animal Sciences, organised by NISER and ILS Bhubaneswar at NISER Bhubaneswar, 11-15 February 2019
- Science for Society, 20th Odisha Bigyan O Paribesh Congress, 17-18 November, 2018 at NISER Bhubaneswar
- Prevention of Suicides among youth, on the World Suicide Prevention Day, The New Indian Express, 10 Sept 2018, Bhubaneswar
- Making Smart Decisions: to be a Michael Corleone or Andy Dufrense or Frank Abagnale Jr., choice is always yours, NMIET Bhubaneswar, 21 August 2018

**Dr. Amarendra Das, Reader F**

- Invited Lecture for Odisha Judiciary Services Probationers on Role of Finance Commission in India at Madhusudan Das Academy, Bhubaneswar o n June 27, 2019.
- Invited Lectures (3 nos.) for Odisha Financial Service Trainees on An overview of World Trade; Instruments of Trade Policy; Fixed vs. Flexible Exchange Rate at Madhusudan Das Academy, Bhubaneswar. During January 07, 2019 and January 19, 2 019.
- Invited lectured delivered on (i) GSDP and its' sectors: Concepts and Definitions: An overview of GSDP of Odisha over time. (ii) Analysis of GSDP in Industry sector in Odisha Over time at RIPAE&S training cum workshop for state government employees, Bhubaneswar during January 19-20, 2018

**Dr. Rooplekha Khuntia, Assistant Professor**

- 'Science – A Human Right'
  International Science Centre and Science Museum Day organised by Regional Science Centre, Bhubaneswar, 10th November, 2018.

**Conferences and Seminars organized by the faculty in the School during 2018-19**

**Dr. Pranaya Kumar Swain, Reader F**

- Seminar-cum-workshop on "Artifacts of Everyday life" involving the Research Committee (RC)-28: Sociology of Everyday Life of Indian Sociological Society (ISS) during 23-24 March 2019
- Vigyan Pratibha workshop, 5-6 March 2019, at NISER Bhubaneswar
- 20th Odisha Bigyan O Paribesh Congress, 17-18 November, 2018 at NISER Bhubaneswar

**Dr. Amarendra Das, Reader F**

- Organised Capacity Building Workshop for Economics Research Schola rs and Young Faculty Members in collaboration with Orissa Economics Association during February 02 - 07, 2019

## Additional information

**Dr. Amarendra Das, Reader F**

- Elected as General Secretary, Orissa Economics Association

**Outreach Programme**

Special Lectures on Econometric Theory and Application, by Dr Vijay Mohan Pillai Associate Professor, Centre for Development Studies, Trivandrum during 06-11 March, 2017 for Post Graduate and Doctoral students of NISER, Utkal University and Ramadevi University, Bhubaneswar.

## STUDENT AFFAIRS

Our students have always been our most prized possessions. Since NISER's inception, we have been trying to create, nurture and sustain an academic environment which can be compared with the best nationally and internationally.
Many of our students have bagged fellowships and awards from various quarters. Some of them are worth a mention here.

Bikramaditya Sahu, PhD student of SMS received NBHM Postdoctoral fellowship to pursue research work at IISc Bangalore
Preeti Prava Sahoo received the Baden-wurtenberg Fellowship Germany to work in Karlshruhe Institute of Technology, Germany.
Ashutosh khandwal received the Japaneese society fellowship for three months work at Japan
Anamika Singh received DAAD Sandwich Model Fellowship to work in The Max Plank Institute for plant Breeding Research, Koln
Three of our PhD students Dr. Adinarayana Bellamkonda, Dr. Woormileela Sinha and Dr. Basujit Chatterjee received the Outstanding Student awards from HBNI for the year 2019

**Placement**

It is a matter of immense pride that the Integrated MSc students that are graduating today have bagged offers for Ph. D. positions from various universities in India and abroad. In India, they have secured positions at TIFR-Mumbai, TIFR-ICTS, TIFR-NCRA, TIFR-TCIS Hyderabad, IISc-Bangalore, IUCAA-Pune, etc. Some of the students who have appeared for the interviews for admissions to the BARC training school are waiting for the results. From abroad, students have received offers from various Universities including many Universiti es under top 50 global rankings in respective subjects. Some of them are Universities of Michigan, California, NUS-Singapore, Ohio, Utah, Utah, Minnesota, Stony Brook, Penn State, Purdue, Iowa, Wisconsin Madison, Illinois-Urbana Champaign, Arizona, Max Plank Institute, Washington State, Rutgers, Hawaii, Florida, Rochester, Southern California, Kansas State, San Diego, Colorado. Many of our students have performed exceedingly well and bagged the CSIR and UGC Fellowships for pursuing Doctoral programmes in various universities in India.

Similarly, the graduating PhD students have secured post-doctoral fellowships from esteemed places like IISc Bangalore, Max Plank Institute, etc.

## RESEARCH AND DEVELOPMENT PROJECTS: EXTRAMURAL FUNDING

### Project during the Year-2018-19

| Sl No. | Project Code | Name of the P.I/Co.PI | Dept. | Sponsoring Dept. | Project Title | Cost of the Project in ₹ | Duration | | Total Year |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | From | To | |
| 1 | MT1801 | Dr. Jaban Meher | SMS | SERB | Identities among eigenforms and Zeros of certain L-functions. | 6,60,000.00 | 29.05.2018 | 28.05.2021 | 3 |
| 2 | MT1802 | Dr. Binod Kumar Sahoo | SMS | SERB | Blocking sets of extenal, secant and tangent lines with respect to a quadric in PG(D,q) | 6,60,000.00 | 28.05.2018 | 27.05.2021 | 3 |
| 3 | MT1804 | Dr.Shyamal Krishna De | SMS | SERB | Cost-effective Methods of Multiple Testing for Sequential Data | 6,60,000.00 | 28.05.2018 | 27.05.2021 | 3 |
| 4 | MT1803 | Dr. Brundaban Sahu | SMS | SERB | Truncated Hypergeometic Series and Supercongruences | 6,60,000.00 | 28.05.2018 | 27.05.2021 | 3 |
| 5 | PH1803 | Dr. Ajaya Kumar Nayak | SPS | SERB | Designing novel materials for exploring magentic skyrmions at room temperature | 39,13,056.00 | 08.06.2018 | 07.06.2021 | 3 |
| 6 | PH1805 | Dr. Braj Singh | SPS | DST | INSPIRE Faculty Award | 95,00,000.00 | 07.05.2018 | 06.05.2023 | 5 |
| 7 | PH1804 | Dr. Jitendra Narayan Dash Under Mentorship of Dr. Ritwick Das | SPS | SERB | National Post Doctoral fellowship | 14,40,000.00 | 04.07.2018 | 03.07.2020 | 2 |
| 8 | BL1801 | Dr. Swayamprava Dalai Under mentorship of Dr K.V.S Badireenath | SBS | SERB | National Post Doctoral fellowship | 19,20,000.00 | 28.06.2018 | 27.06.2020 | 2 |
| 9 | BL1802 | Dr. Rakesh Chatterjee Under mentorship of Dr. Rudresh Acharya | SBS | SERB | National Post Doctoral fellowship | 19,20,000.00 | 28.06.2018 | 27.06.2020 | 2 |
| 10 | CH1801 | Dr. Prasenjit Mal | SCS | CSIR | Visible Light photoredox organocatalysis via two photon excitation methodology in oxidative cross coupling reactions. | 20,88,000.00 | 24.04.2018 | 23.04.2021 | 3 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 11 | CH1802 | Dr. A. Srinivasan | SCS | SERB | Contracted and Expanded Prophyrin Analogues with Polycyclic Aromatic Units :Syntheses and Applications. | 49,97,696.00 | 01.08.2018 | 31.07.2021 | 3 |
| 12 | CS1801 | Dr. Rishiraj Bhattacharyya | SCoS | SERB | Property testing or probability Distributions with conditional Samples and Applications to Cryptography | 19,99,690.00 | 21.08.2018 | 20.08.2021 | 3 |
| 13 | CH1803 | Dr. Upakarasamy Lourderaj | SCS | SERB | Computational studies on the Mechanisms and Dynamics of Substitution Reactions. | 21,09,628.00 | 12.09.2018 | 11.09.2021 | 3 |
| 14 | CS1802 | Dr.Aritra Banik | SCoS | SERB | Design of Efficient Algorithms for Multiple Choice Resource Allocation Problems. | 6,05,098.00 | 11.11.2018 | 19.09.2019 | 3 |
| 15 | CH1805 | Dr. S. Peruncheralathan | SCS | SERB | Catalytic Enantioseletive Desymmetrization of Prochiral and meso-Compounds with Quaternary Carbon Centers | 42,19,600.00 | 23.10.2018 | 22.10.2021 | 3 |
| 16 | CH1804 | Dr. P.C Ravikumar | SCS | SERB | Development of first-row transition metal caralyzed C-H activation approach for the enantioselective synthesis of complex tri-and tetra-cyclic alkaloid natural product and their hybrid structures. | 56,49,600.00 | 26.10.2018 | 25.10.2021 | 3 |
| 17 | MT1803 | Dr. Ritwik Mukherjee | SMS | SERB | Enumerative Geometry and Gromov-Witten invariants. | 6,60,000.00 | 16.07.2018 | 15.07.2021 | 3 |
| 18 | CH1806 | Dr. Nagendra Kr. Sharma | SCS | DBT | CRISPR-RNA-Cas9 System: Syntheses and Biochemical Evaluations of Nucleobase Modified tropolonylRibose Nucleoside in CRISPR-RNA | 83,86,800.00 | 10.01.2019 | 09.01.2022 | 3 |
| 19 | CH1809 | Dr. Sanjib Kar | SCS | CSIR | Design of novel Cobalt (II) -porphyrin based catalysts for cyclopropanation of olefins. | 3,00,000.00 | 05.08.2018 | 04.08.2021 | 3 |
| 20 | PH1806 | Dr. Sudipan De | SPS | DST | INSPIRE Faculty Award | 19,00,000.00 | 24.01.2019 | 23.01.2024 | 5 |
| 21 | CH1807 | Dr.Bidraha Bagh | SCS | SERB | Activation of Small Molecules and | 34,98,240.00 | 28.02.2019 | 27.02.2022 | 3 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Hydrofunctionalizations by Cooperative Catalysis with Sustainable First Row Transition Metals and Non-innocent Ligands. | | | | |
| 22 | PH1807 | Dr. Colin Benjamin | SPS | SERB | Nash equilibrium versus Pareto optimality in N-Player games. | 6,60,000.00 | 12.03.2019 | 11.03.2022 | 3 |
| 23 | CH1808 | Dr. Himansu Sekhar Biswal | SCS | SERB | Electronic and vibrational spectroscopic investigations of thioamides as potential surrogates of Amides in peptides. | 53,22,140.00 | 09.03.2019 | 08.03.2022 | 3 |
| 24 | BL1901 | Dr. Bedabrata Saha(NPDF) Under mentoship of Dr. K.C Panigrahi | SBS | SERB | National Post Doctoral fellowship | 19,20,000.00 | 07.03.2019 | 06.03.2021 | 2 |
| 25 | CS1901 | Dr. Subhankar Mishra | ScoS | DST-NRDMS | Auto BIM: Automatic discovery and construciton of building information model | 18,84,344.00 | 11.03.2019 | 10.03.2021 | 2 |
| 26 | MT1901 | Dr. Manas Ranjan Sahoo | SMS | SERB | Vanishing pressure and vanishing viscosity limit for some non-strictly hyperbolic systems of conservation laws | 6,60,000.00 | 22.03.2019 | 21.03.2022 | 3 |
| 27 | PH1901 | Dr. Sanjay Kr. Swain | SPS | DST-MSD | Indian Institutions-Fermilab Collaboration in neutrino physics | 1,14,18,000.00 | 28.03.2019 | 27.03.2024 | 5 |
| 28 | MT1806 | Dr. Panchugopal Bikram | SMS | SERB | BI-CENTRALIZER OF q-DEFORMED ARAKI-WOODS VON NEUMANN ALGEBRAS. | 5,71,780.00 | 05.03.2019 | 04.03.2022 | 3 |
| 20 | PH1806 | Dr. Sudipan De | SPS | DST | INSPIRE Faculty Award | 19,00,000.00 | 24.01.2019 | 23.01.2024 | 5 |
| 21 | CH1807 | Dr.Bidraha Bagh | SCS | SERB | Activation of Small Molecules and Hydrofunctionalizations by Cooperative Catalysis with Sustainable First Row Transition Metals and Non-innocent Ligands. | 34,98,240.00 | 28.02.2019 | 27.02.2022 | 3 |
| 22 | PH1807 | Dr. Colin Benjamin | SPS | SERB | Nash equilibrium versus Pareto optimality in N-Player games. | 6,60,000.00 | 12.03.2019 | 11.03.2022 | 3 |
| 23 | CH1808 | Dr. Himansu Sekhar Biswal | SCS | SERB | Electronic and vibrational spectroscopic | 53,22,140.00 | 09.03.2019 | 08.03.2022 | 3 |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | | investigations of thioamides as potential surrogates of Amides in peptides. | | | | |
| 24 | BL1901 | Dr. Bedabrata Saha(NPDF) Under mentoship of Dr. K.C Panigrahi | SBS | SERB | National Post Doctoral fellowship | 19,20,000.00 | 07.03.2019 | 06.03.2021 | 2 |
| 25 | CS1901 | Dr. Subhankar Mishra | ScoS | DST-NRDMS | Auto BIM: Automatic discovery and construciton of building information model | 18,84,344.00 | 11.03.2019 | 10.03.2021 | 2 |
| 26 | MT1901 | Dr. Manas Ranjan Sahoo | SMS | SERB | Vanishing pressure and vanishing viscosity limit for some non-strictly hyperbolic systems of conservation laws | 6,60,000.00 | 22.03.2019 | 21.03.2022 | 3 |
| 27 | PH1901 | Dr. Sanjay Kr. Swain | SPS | DST-MSD | Indian Institutions-Fermilab Collaboration in neutrino physics | 1,14,18,000.00 | 28.03.2019 | 27.03.2024 | 5 |
| 28 | MT1806 | Dr. Panchugopal Bikram | SMS | SERB | BI-CENTRALIZER OF q-DEFORMED ARAKI-WOODS VON NEUMANN ALGEBRAS. | 5,71,780.00 | 05.03.2019 | 04.03.2022 | 3 |

## SEVENTH GRADUATION CEREMONY

The 7th Graduation Ceremony was held on 8th June, 2018. Honourable Chief Guest Prof. P.R. Vasudeva Rao, Vice Chancellor, Homi Bhabha National Institute, formerly Director of Indira Gandhi Centre for Atomic Research had graced the occasion and awarded the degrees to the Graduated students.

Twenty-Six Ph. D scholars and Fifty-five Integrated M.Sc students were graduated in the 7th Graduation ceremony.
School wise award of degree in 'Doctor of Philosophy' duri ng the 7th Graduation Ceremony held on 8th June, 2018 is as follows.

1. School of Biological Sciences = 09
2. School of Chemical Sciences = 13
3. School of Physical Sciences = 04

The students who own various awards in the 7th graduati on Ceremony are mentioned below:

**Gold Medal for Best All Round Performances -2018**

Mr. Sharba Bhattacharjee (School of Physical Sciences)

**Silver Medal for Best Academic Performance in each discipline of the graduating class -2018**

Ms. Manaswini Kar (School of Biological Sciences)
Mr Subhadeep Bera (School of Chemical Sciences)

Mr.Subham Girdhar (School of Mathematical Sciences)
Mr. Sharba Bhattacharjee (School of Physical Sciences)

**Best M.Sc Thesis Award -2018**

Ms. Manaswini Kar (School of Biological Sciences)
Mr.Sesha Kisan (School of Chemical Sciences)
Mr.Subham Girdhar (School of Mathematical Sciences)
Mr. Sharba Bhattacharjee (School of Physical Sciences)

**Memorial Awards -2018**

1. Winner of Sarat Chandra Annapurna Award -2018
   Mr. Sharba Bhattacharjee (School of Physical Sciences)
2. Winner of Smt. Jayalaxamma Award -2018
   Mr Subhadeep Bera (School of Chemical Sciences)
3. Winner of Prof.Tribikram Pati Memorial Award -2018
   Mr. Subham Girdhar (School of Mathematical Sciences)
4. Winner of Dr Sumitra Moharana Memorial Aw ard-2018
   Ms. Manaswini Kar (School Biological Sciences)

**Awards by Ph. D Students**

The following Ph. D students from School of Chemical Sciences, NISER were selected for the "HBNI Outstanding Student award 2019" and were felicitated on 03/06/2019, the Foun dation Day of HBNI.

1. Dr. Adinarayana Bellamkonda
2. Dr. Woormileela Sinha
3. Dr. Basujit Chatterjee

**Admission Statistics in the 5yr Integrated M.Sc programme, 2018**

Approved intake for 5 year integrated M.Sc programme is 200
Total admitted into the 5 year integrated M.Sc programme in the year 2018 is 182.

**Admission Statistics in the PhD programme, 2018**

| | | |
|---|---|---|
| School of Biological Sciences | = | 15 |
| School of Chemical Sciences | = | 23 |
| School of Computer Sciences | = | 00 |
| School of Mathematical Sciences | = | 03 |
| School of Physical Sciences | = | 08 |
| School of Humanities & Social Sciences | = | 07 |

**Admission Statistics in the Integrated M.Sc–PhD programme, 2018**

| | | |
|---|---|---|
| School of Physical Sciences | = | 05 |

# INFRASTRUCTURE

NISER Bhubaneswar Project at Jatni was undertaken and completed by M/s L&T under the supervision of Directorate of Construction, Services and Estate Management (DCSEM), Mumbai along with the help of NISER, Institute Works Department (IWD). It covers an area of 300 acres and is located at Jatni along Jatni-Khurda road, Odisha at a distance of about 6 km from NH-5.

**Permanent Campus at Jatni**

NISER, Jatni Project comprises a total of 127 buildings, having plinth area 175937.92 sqm. The building comprises of various types like Academic buildings, Amenities buildings, Service buildings, Residential, Hostels.

**Academic building** consists of Schools of Chemical Science, Biological Science, Library, Physical Science, Mathematical Science, Humanities and Social Science, Green House, Animal House, Auditorium, Workshop and Meditation center. **Amenities building** consist of Health center, bank and Post office, Primary school, Community Centre and shopping complex, Student activity center and Aquatic complex.
**Service building** consists of AC plant room, Main receiving station (MRS), Local control substations (LCS), Gas bank, water works and gate house. **Residential Buildings** consist of Flats of A, B, C, D and individual duplex houses like E type, Dean Bungalow and Director Bungalow. **Hostels** consist of Double Occupancy and single Occupancy.

Plantation drives have been a regular feature at NISER permanent campus being constructed at Jatni. Every year while celebrating the significant days such as: Republic Day, Independence Day and NISER Foundation Day, the staff, students and faculty members of NISER participate in the go-green drive sending out a message to the stakeholders and public at large to care for and preserve our immediate environment. Thousands of saplings have been planted and various other plantation drives are being taken up from time to time with a target to make the campus as one of the greenest campus in India. This was the pledge taken after the NISER was officially dedicated to Nation by Honorable Prime Minister, Shri Narendra Modi on 7th February 2016. The campus has been shifted to its permanent campus on 1st July, 2015 after which the works department is very much actively participating the needs of its end users i.e. staff, faculties and residents.

Rain water harvesting structures like ground water recharging pits and ponds in the Jatni campus of NISER. The water to the campus is filled in the water tank placed at the hill top from where the water is filled to the respective water tanks at the multi storied buildings through gravity which is economical as far as the expenditure with regards to keeping a pump and its operation and consumption of diesel etc. The Sewage Treatment Plant (STP) is in place. The treated water from the STP can be used for arboriculture and landscaping.

Recently, the thermoplastic marking on road was done within scheduled date and the kerb stone painting and marking done. In order to arrest the soil slipping out during rain, kerb walls in left over portion taken up and completed. This enhances the scenic beauty of the campus also the numbering of all residential quarters done.

**Photo of Permanent Campus at Jatni**

**Some of the salient features of this project are:**

Water harvesting is fully ensured by recharging of ponds in the campus by rain water and ground water recharging pits. STP and ETP are provided to make use of waste water. Separate flushing tank is provided, so that STP treated water can be used in flushing. To ensure minimum water utilisation dual flushing system is provided.

Proper utilisation of day light to conserve electricity by providing glass window and Polycarbonate sheets in the top truss enabling proper lighting. The orientation of building was done in such a way that proper lighting and ventilation is ensured. To ensure heat transfer thermal insulation to the top floor is provided in academic complex.

The water tank catering to the entire campus water demand is placed at the top most location of the campus enabling proper conservation of pumping charges and allied expenses. The water is able to reach the high rise buildings through gravity as a result of this arrangement. A separate irrigation tank is provided for arboriculture.

Smoke proof doors around the corridors to confine the smoke in local area so that rescue can be done. Fire proof doors (2hrs resistivity) at exit point of staircase in every floor during fire emergency.

**Source of Electricity and water in campus.**

The electricity supply for NISER campus is arranged from Aurugul Grid (5km) near IIT Bhubaneswar which was successfully energized since 28 th April 2015.

The shopping complex is also taken over. Various shops have been allotted.

The community centre is already in place which is being regularly used by staff and faculty for family functions and various departmental functions. In construction of various things proper

value engineering is taken care and accordingly the scarps taken over from fencing materials are used as guard rails saving huge amount of money etc.

The solid waste disposal is being maintained by Jatni Municipality. Jatni Municipality is pic king the solid waste daily and dumping in their designated dump yards.

## OUTREACH AND SUMMER PROGRAMMES

NISER has been conscious of its responsibility to reach out to society. As part of our outreach activity we conduct regular workshops and training progra mmes, particularly in the discipline of mathematics. Our colleagues from this school have been doing a commendable job in this regard catering to students and teachers from Odisha and other parts of the country.

NISER has conducted a highly successful science day celebration which involved lectures and practical demonstrations to school children. We hope to be able to kindle the interest of society in general and young students in particular in science and technology and to be able to attract students to pursue a career in science.

We also accept students from other reputed Institutes of the country such as IISERs, NITs, etc. who express their interest to do summer projects under the supervision of our faculty members. NISER has been more than happy to allow such interested students to leverage its facilities for initiating new or furthering ongoing research activities. Similarly, our students also embark for some of the best places during summers to learn new things as well as to expand and fine -tune their existing knowledge.

## MISCELLANEOUS

**International Day of Yoga**

International Day of Yoga was celebrated by the institute on 21.06.201 8. NISER conducted various yoga sessions, pranayama etc in which the faculty members, staff and students of the institute participated with all enthusiasm.









अन्तर्राष्ट्रीय योग दिवस
YOGA

**Foundation Day**

Since the inception of NISER, the Institute has been celebrating its foundation day every year. On this occasion eminent scientists are invited to deliver popular lectures. On 6th September 2018, NISER celebrated its 9th Foundation Day of the institute, commemorating initiation of the academic programs at NISER. On this occasion, NISER had the pleasure to have Prof. Madabusi Santanam Raghunathan, formerly Professor of eminence at TIFR in Homi Bhabha Chair and a Fellow of the Royal Society, of the Third World Academy of Sciences and of the American Mathematical Society and a recipient of the civilian honour of Padma Bhushan. Prof. Raghunathan delivered the foundation day talk titled, "Playing on the seashore? - the pursuit of science".

**Sadbhavana Diwas**

The Sadbhavana Diwas was observed on 20th August 2018. All the officers and employees took the Sadbhavana Pledge for maintaining communal harmony.

**Rastriya Ekta Diwas (National Unity Day)**

The Rastriya Ekta Diwas was observed 31st October, 2018. Director, NISER administered Rastriya Ekta Pledge to all the officers and employees of the institute.

**Vigilance Awareness Week**

The vigilance awareness week was observed during 29th October, 2018- 03rd November, 2018 All the employees of NISER took the oath of official secrecy and pledged on 01st November, 2018, for maintenance of honesty and transparency while delivering their work.

**Constitution Day observation**

The day was observed on 26.11.2018. The day was marked with address by Director, Registrar and reading of preamble.

**Seminars/Conferences/Workshops etc. during the period 2018 -19**

- Training Program in Mathematics - 2018 (21/05/2018 to 16/06/2018)
- Workshop on Cyber Security 2018 (15/06/2018 to 17/06/2018)
- A symposium on Heavy-ion physics at FAIR, RHIC and LHC facilities (18/06/2018 to 19/06/2018)
- Workshop on Light microscopies and Live Cell imaging (16/07/2018 to 17/07/2 018)
- International Conference on Microscopy and XXXIX annual meeting of Electron Microscope Society of India (18/07/2018 to 20/07/2018)
- Advance Instructional School on Stochastic Processes 2018 (25/06/2018 to 21/07/2018)
- Vigyan Pratibha - GOI initiative (22/07/2018)
- ALICE-STAR-INDIA Collaboration Meeting (17/09/2018 to 20/09/2018)
- Indian Women and Mathematics: Regional Workshop on Research and Opportunities (27/10/2018 to 28/10/2018)
- 20th Odisha Bigyan 'O' Paribesh Congress (17/11/2018 to 18/11/2018)
- Workshop on Number Theory (30/11/2018 to 06/12/2018)
- International Conference on Magnetic material and Applicaions (09/12/2018 to 13/12/2018)
- Inter IISER-NISER Sports Meet (15/12/2018 to 20/12/2018)
- National Bioorganic Chemistry Conference (22/12/2018 to 24/12/2 018)

- Advanced Instructional School on Harmonic Analysis (17/12/2018 to 05/01/2019)
- प.ऊ.?व. का 19वां अ?खल भारतीय राजभाषा स?मेलन (03/02/2019 to 05/02/2019)
- Recent Trends in Algorithms (07/02/2019 to 10/02/2019)
- 4th Orientation Workshop: Laboratory Animal Sciences (11/03/2019 to 15/03/2019)
- Topical Meeting on Advances in Photonics (29/03/2 019 to 30/03/2019)
- String theory and Cosmology (28/03/2019 to 31/03/2019)

**Implementation of Official Language in NISER:**

NISER being a central autonomous institution under the Department of Atomic Energy, Government of India, is committed for effective impl ementation of Official Language Policy of the Union. In terms of the policy, an *"Official Language Implementation Committee (OLIC)"* under the Chairmanship of Director, NISER consisting of all functional section In-charges has been constituted to monitor the activities of official language. The committee meets quarterly and makes various decisions for proper implementation of the policy level orders, instructions received from DAE as well as Government of India. Under the policy, some of the mandatory requirements like bilingual signage, stamps, letterheads, publication of advertisements, Tenders, Reports are being done in the institute. The staffs that have been trained through various official language Hindi courses are doing their official work partially i n Hindi. To encourage and motivate more employees to work in Hindi, the DAE's Hindi Incentive Scheme has also been implemented in the Institute. Time to time the Institute also conducts Seminars, Conferences, Workshops and also some competitive events in official language Hindi. Some of such major events and activities conducted during the year 2018-19 are described below:

1. **Hindi fortnight** was observed during September 1st to 15th, 2018. On this occasion following events / activities were conducted:

    a. **Hindi Film Quiz Competition:** This event was conducted on September 7th, 2018 and coordinated by Dr. Pranay Swain. Amongst the participants, groups of two people were formed. Winner groups of this event were:
        i. **First Prize (Cash award of Rs.2000):** Ms. Sandeepa Sahoo and Ms. Bishnupriya Das
        ii. **Second Prize (Cash award of Rs.1500):** Shri Heeralal Das and Shri Vijay Singh
        iii. **Third Prize (Cash award of Rs.1000):** Shri Abhishek Kumar and Shri Dishant Swain

    b. **Hindi Essay writing competition:** This event was conducted in two categ ories viz. Students and Employees on September 7th, 2018 on the topics of **"Swachh Bhaarat Abhiyaan" and "Tyohaaron Ka Jeevan Me Mahatwa"** respectively. Winners of this competition were:

    **Students Category:**
        i. **First Prize (Cash award of Rs.2000):** Ms. Kiran Meena
        ii. **Second Prize (Cash award of Rs.1500):** Shri Aditya Pal

iii. **Third Prize (Cash award of Rs.1000):** Shri Deepanshu Kumar and Shri Santosh Saurabh Sahoo

**Employees Categories:**

i. **First Prize (Cash award of Rs.2000):** Shri Mukesh Kumar Meena
ii. **Second Prize (Cash award of Rs.1500):** Ms. Babita Pradhan
iii. **Third Prize (Cash award of Rs.1000):** Shri Saubhagya Mahapatra

c. **Short – Speech programme in Hindi on the topic of "Science and Religion" was organized on HINDI – DIWAS:** This competitive event was conducted amongst the two categories viz. "***Hindi Speaking" and "Non Hindi speaking***". The winners of this event were:

**1. Hindi Speaking Category:**

i. **First Prize (Cash award of Rs.2000):** Shri Santosh Saurabh Sahoo
ii. **Second Prize (Cash award of Rs.1500):** Ms. Priya Sahu
iii. **Third Prize (Cash award of Rs.1000):** Dr. Sourabh Chawla

**2. Non-Hindi Speaking Category:**

i. **First Prize (Cash award of Rs.2000):** Mr. Victor Banerjee
ii. **Second Prize (Cash award of Rs.1500):** Mr. Radha Madhab Paathi
iii. **Third Prize (Cash award of Rs.1000):** Mr. Mr. Rahul Raj Mishra

Some of the Photographs of Hindi-Diwas celebration & prize distribution to the winners of different events conducted during the Hindi fortnight are depicted below:






2. **Organization of Hindi Workshops/Seminars/ Conferences:**

a) A Joint Hindi workshop was orga nized at DAE Central School IRE, OSCOM , Chhatarpur, Odisha on 19.12.2018 in collaboration with NISER, IOP, HWP, IRE. The workshop was attended by 26 officials from all the above mentioned collaborative DAE institutions.

b) A one day annual Official Lan guage Seminar in collaboration with NISER, IOP, IMMT, AIIMS, CIFA, CIWA, & ILS was organized on the occasion of World Hindi Day i.e. on January 10 th, 2019 at CIFA Bhubneswar. There were more than 100 participants from all the collaborative institutions have attended the Seminar. From NISER 15 officials have participated and two Scientific Officers viz. Dr. Arun Kumar from SCS and Dr. Saurabh Chawla from SBS have contributed by delivering lecture in Hindi based on the theme of the Seminar. The event was Co-coordinated by Mr. Dinesh Bahadur Singh, APO and Officer In -Charge, Official Language, NISER.

c) DAE's 19th All India Official Language Conference was successfully organized in the Institute on February 2nd, 2019 followed by three days Hindi Workshop for AD (OL) and DD (OL) of DAE. The conference was attended by many senior officials of DAE and its constituents Units, PSUs, Statutory Bodies and Autonomous / Aided Institutes throughout the country. All arrangements made by the institute for this conference a nd workshop were well appreciated by the participants. Few glimpses of the conference and workshop are shown below:





19th


भाग
भाषा सम्मेलन


19th


19th
परमाणु ऊर्जा विभाग
अखिल भारतीय राजभाषा सम्मेलन


19th
परमाणु ऊर्जा विभाग
अखिल भारतीय राजभाषा सम्मे
2 फरवरी 2019


19th
परमाणु ऊर्जा विभाग
अखिल भारतीय राजभाषा सम्मेलन
2 फरवरी 2019
आयोजन स्थलः

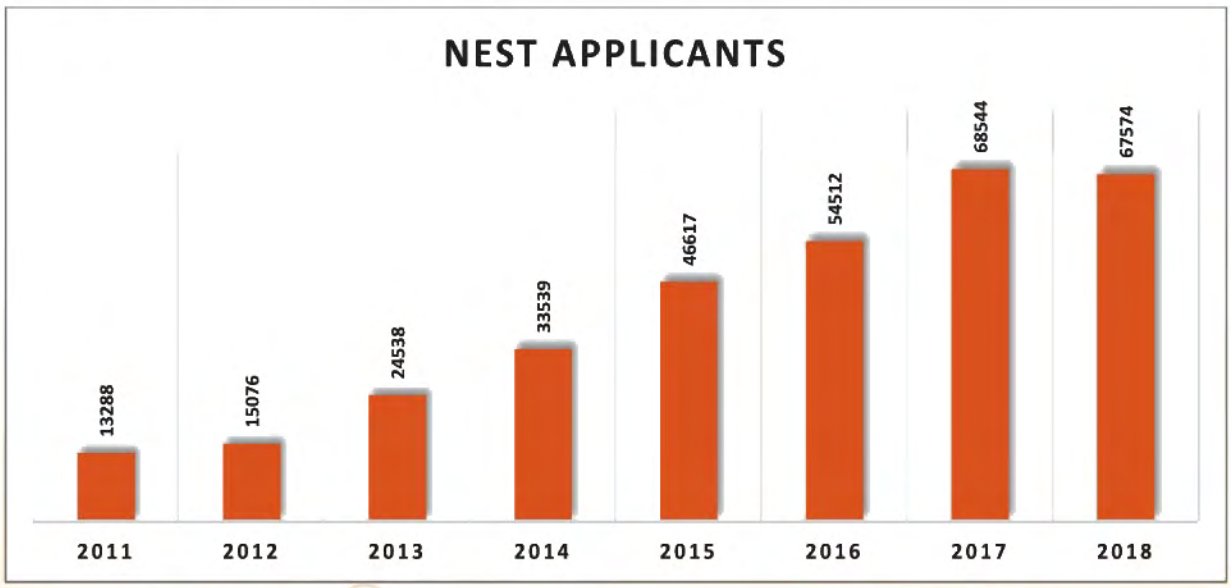

19th
परमाणु ऊर्जा विभाग
अखिल भारतीय राजभाषा सम्मेलन
2 फरवरी 2019
आयोजन स्थलः

## NATIONAL ENTRANCE SCREENING TEST (NEST)

### Intake to the Flagship program – NEST

National Entrance Screening Test (NEST), the nation-wide test that NISER conducts to select the most deserving candidates for admission into its flagship programme, has been extremely popular and effective. NEST is conducted for admission to National Institute of Science Education and Research (NISER), Bhubaneswar and University of Mumbai - Department of Atomic Energy Centre for Excellence in Basic Sciences (UM-DAE CBS), Mumbai. National Entrance Screening Test 2018, was conducted on June 02, 2018 (Saturday) at various centers in 94 cities/towns across the country for admissions into Integrated M. Sc programs of NISER, Bhubaneswar and UM-DAE CEBS, Mumbai, for admissions into Integrated M. Sc programs of NISER, Bhubaneswar and UM-DAE CEBS, Mumbai. A total of 67,574 applications were received for NEST 2018 examination. Out of which, nearly 27,000 applications were from Odisha and Kerala put together alone. NEST 2018 examination was conducted in two sessions on the same day, with two different sets of question papers of equal/comparable diffic ulty level. Examination was conducted in 94 major cities/towns across the country. The result for NEST 2018 was published on the website on June 18, 2018 [Third Monday of June]. Proposed student intake at NISER, Bhubaneswar for was: 200+2 (J&K) for the session 2018-23. Total 201 candidates were admitted into various streams of integrated M. Sc program of NISER for the Academic Session 2018-23

Number of applications received over the years is depicted below.




Brief summary of the gender and category wise applicants is as follows:

| Gender | GEN | OBC | SC | ST | PD | Total |
|---|---|---|---|---|---|---|
| **Male** | 19,368 | 10,640 | 3,786 | 1,267 | 178 | 35,061 |
| **Female** | 18,509 | 10,229 | 2,817 | 958 | 74 | 32,513 |
| | | | | | **TOTAL** | 67,574 |

The state wise distribution of the applications received is shown in the following table.

| State of Domicile | Number | Percentage |
|---|---|---|
| Odisha | 15522 | 22.970 |
| Kerala | 11056 | 16.361 |
| Uttar Pradesh | 5745 | 8.502 |
| West Bengal | 5229 | 7.738 |
| Maharashtra | 3263 | 4.829 |
| Rajasthan | 3120 | 4.617 |
| Bihar | 2846 | 4.212 |
| Tamil Nadu | 2362 | 3.495 |
| Andhra Pradesh | 2261 | 3.346 |
| Telangana | 1957 | 2.896 |
| Haryana | 1733 | 2.565 |
| Madhya Pradesh | 1674 | 2.477 |
| Himachal Pradesh | 1644 | 2.433 |
| Delhi | 1608 | 2.380 |
| Chhattisgarh | 1341 | 1.984 |
| Jharkhand | 1325 | 1.961 |
| Karnataka | 1007 | 1.490 |
| Uttarakhand | 711 | 1.052 |
| Punjab | 653 | 0.966 |

| | | |
|---|---|---|
| Gujarat | 599 | 0.886 |
| Assam | 575 | 0.851 |
| Tripura | 334 | 0.494 |
| Jammu and Kashmir | 321 | 0.475 |
| Chandigarh | 180 | 0.266 |
| Puducherry | 165 | 0.244 |
| Manipur | 96 | 0.142 |
| Arunachal Pradesh | 90 | 0.133 |
| Meghalaya | 53 | 0.078 |
| Goa | 31 | 0.046 |
| Dadra and Nagar Haveli | 21 | 0.031 |
| Andaman and Nicobar | 17 | 0.025 |
| Lakshadweep | 12 | 0.018 |
| Sikkim | 12 | 0.018 |
| Nagaland | 06 | 0.009 |
| Mizoram | 03 | 0.004 |
| Daman and Diu | 02 | 0.003 |
| **TOTAL** | **67,574** | **100%** |

The admissions to the Ph. D programmes were conducted through an even more rigorous process that included short-listing of eligible applicants followed by in-house written tests and interviews.

The selection process for the Ph. D programmes in various schools were completed in the month of July 2018 and January 2019. Close to one thousand seven hundred applications were received for the Ph. D programme this time and the school wise break up of Ph. D and Integrated Ph. D is as follows:

| Sl. No | School | Number of Applications Received | Number of Candidates Shortlisted for Interview | Number of candidates appeared | Number of candidates admitted |
|---|---|---|---|---|---|
| 1. | School of Physical Sciences | 528 | 228 | 89 | 07 |
| 2. | School of Biological Sciences | 502 | 248 | 120 | 13 |
| 3. | School of Mathematical Sciences | 281 | 161 | 114 | 03 |
| 4. | School of Chemical Sciences | 295 | 278 | 122 | 19 |
| 5. | School of Humanities and Social Sciences | 76 | 74 | 31 | 02 |
| 6. | Integrated M.Sc – PhD in School of Physical Sciences | 244 | 74 | 38 | 05 |

## STUDENTS ACTIVITIES

**Social Initiative: ZARIYA**:


Like every year, Zaariya was proactive throughout the year and involved the NISERites as well as social activists, in and around, in various tasks and events. The student vol unteers of Zaariya spent Raksha Bandhan with specially-abled children of "Chetna Institute of Mentally Handicapped". Among various other things they tied rakhi, distributed sweets, and spent the day in merrymaking. Zaariya, like every year, organised its a nnual fundraising event, Food Fest, on the auspicious occasion of Diwali with a really good turn up including students, staff and faculty members. They also conducted a science merit examination, SciQuest, for the students of classes 8, 9 and 11. The ongoing project of guiding the small kids of Uparbasta, a nearby village, was continued with utmost dedication and newer methods and approaches were tried to have a greater impact on them. Besides, blood donation camps, donations to relief funds of calamities, condolences and tributes, festival celebration with the needy, etc. were carried out throughout the year

**The Weekly**:

The Quizone Club conducts a weekly e-quiz for the members of our institute. Interesting and intriguing might be the only words which cou ld describe it.

**Inter IISER sports meet**:

The 7th Inter-IISER NISER Sports Meet (IISM) 2018 was hosted by NISER with six days of intense competition among the ten participating institutions. IISER Bhopal finished as the overall champions of IISM 2018, while IISER Thiruvananthapuram took home the coveted athletics championship. Bhopal bagged golds in chess, girls' badminton and boys' football among others. IISER Mohali and IISER Kolkata also performed extraordinarily, finishing as overall second and third respectively. Other notable performances came from IISc, who won the gold in volleyball, and IISER Pune who won gold in mixed badminton and men's table tennis. The hosts NISER put up a spirited performance, inspired by a gold winning effort by its men's ba dminton team, led by Himanshu Choudhary. NISER finished overall fourth alongside IISc Bengaluru, its best finish since the inception of IISM.

The closing ceremony had a cultural programme of classical Odissi dance, and was followed by the prize distribution.

**Science Activities Club**:

The SAC is actively engaged in conducting various types of sessions for the science enthusiasts. Seminars, Skype sessions(Webinar) with experts from various fields of science and observation

sessions are some of the activities of the Science Activities Club. They have had various Astronomy sessions, telescope handling sessions and LIGO webinars.

**Cleanliness Drive**:
The youngest members of our NISER family, the first-year Integrated MSc. Students, have continuously made efforts towards keeping our campus clean. In order to create awareness amongst the students they even performed a street play (Nukkad). And after that we all wore safety gloves and cleaned our hostel premises. The first years continue to pursue their goal till date. They have taken the initiative to put up dustbins on the sidewalks leading to our hostels.

**SPICMACAY NISER**
NISER chapter hosted various events during the past academic year - a performance by Vidushi Madhusmita Mohanty in December 2018 and a mesmerizing puppet show by the Doll's Theater in August 2018. Few more events of SpicMacay are in the pipeline in coming months.

**International Yoga Day** was celebrated on 21 June 2018 with enthused participation from NISER family members.

**Drama and Music Club**
Our students have a very vibrant drama and music club. The students showcase their artistic creativity through activities on various festive occasions. To name a few, they put up cultural activities during Holi, Diwali, Eid, Chirstmas. Koffee with Kishore is another event that the students organize every year on a grand scale to commemorate the birthday of the legendary singer Kishore Kumar.

**Sports**
Sports and games constitute a major part of campus life for our students. It is not just a coincidence than the words like "students", "science" and "sports" start with the same letter. Sports wise also, our students have quite a busy annual calendar. Apart from the regular sporting activities, the students organize their NISER Premier League and NISER Football Lea gue twice a year and the Annual Sports Meet.

## OUTSTANDING PERFORMERS AWARD

Our Administrative and Technical staff play an invaluable role in ensuring the smooth functioning of all Institute activities. This year (2019) on Republic Day the Institute acknowledged the contributions made by them and felicitated several members of the NISER family for their devotion to duty. The Institute has also decided to make the excellence awards an annual component of our Republic Day celebrations.


**Dr. Saurabh Chawla, Scientific Officer -D**


**Smt. Shabnam Khanum, Assistant Personnel Officer**


**Shri Amit Kumar panigrahi, Scientific Assistant -D**


**Smt. A B Rosy, Office Assistant (Multi Skill)**

# LIST OF NISER ADMINISTRATIVE STAFF

| Sl. No. | Name of the Employee | Designation |
|---|---|---|
| 1 | Dr. A. K. Naik | Registrar |
| 2 | Shri Deepak Srivastava | Stores & Purchase Officer |
| 3 | Mrs. Shabnam Khanum | Assistant Personnel Officer |
| 4 | Shri Dinesh Bahadur Singh | Assistant Personnel Officer |
| 5 | Shri Rajeev Kumar Singh | Assistant Personnel Officer |
| 6 | Shri Bibhupada Tripathy | Administrative Officer -III |
| 7 | Shri Ramakant Kar | Administrative Officer -III |
| 8 | Smt. A B Rosy | Office Assistant (MS) |
| 9 | Shri D. Lingaraj | Office Assistant (MS) |
| 10 | Shri Sujit Kumar Bastia | Office Assistant (MS) |
| 11 | Smt. Smruti Kanungo | Office Assistant (MS) |
| 12 | Ms. Monalisa Baliarsingh | Office Assistant (MS) |
| 13 | Shri Vijay Singh | Office Assistant (MS) |
| 14 | Shri Madhusudan Padhy | Office Assistant (MS) |
| 15 | Smt. Lipsa Das | Office Assistant (MS) |
| 16 | Smt. Lopamudra Sahoo | Office Assistant (MS) |
| 17 | Shri Nabin Kumar Sahoo | Office Assistant (MS) |
| 18 | Smt. Banita Pradhan | Office Assistant (MS) |
| 19 | Smt. Elina Das | Office Assistant (MS) |
| 20 | Shri Amarendra Kumar Behera | Office Assistant (MS) |
| 21 | Shri Ranjan Kumar Das | Office Assistan t (MS) |
| 22 | Shri Abhaya Kumar Mohanty | Assistant Personnel Officer |
| 23 | Shri Hiralal Das | Assistant Personnel Officer |
| 24 | Smt. Apolina Lakra | Office Assistant (MS) |
| 25 | Shri Susanta Kumar Sethi | Operator (General Function) |
| 26 | Smt. Sasmita Sahoo | Operator (General Function) |
| 27 | Ms. Sandeepa Sahoo | Operator (General Function) |
| 28 | Shri Subrat Ranjan Hota | Operator (General Function) |
| 29 | Shri Jogendra Jena | Operator (General Function) |
| 30 | Shri Tusar Kanta Sahoo | Operator (General Function) |
| 31 | Shri Pradeep Kumar Mishra | Assistant Personnel Officer |
| 32 | Shri Chandra Sekhar Mahapatra | Assistant Personnel Officer |
| 34 | Shri Gopal Krishna Rath | Assistant Personnel Officer |
| 34 | Shri Purna Chandra Sahu | Assistant Personnel Officer |
| 35 | Ms. Bishnupriya Das | Operator (General Function) |
| 36 | Shri Dolananda Pradhan | Assistant Personnel Officer |
| 37 | Shri Dhaneswar Nayak | Assistant Personnel Officer |
| 38 | Shri Sanjay Kumar Patro | Assistant Personnel Officer |
| 39 | Shri Chitta Ranjan Nayak | Clerk-A |
| 40 | Ms. Babita Pradhan | Clerk-A |
| 41 | Shri M Siba Prasad Rao | Clerk-A |
| 42 | Shri Biplab Kanungo | Clerk-A |
| 43 | Shri Bijay Kumar Behera | Clerk-A |

## SCIENTIFIC AND TECHNICAL STAFF

| Sl. No. | Name of Employees | Designation |
|---|---|---|
| 1 | Shri Ranjan Kumar Rana | Scientifc Assistant 'D' Electrical |
| 2 | Shri Jitendra Narayan Dash | Scientifc Assistant 'D' Library |
| 3 | Shri Dipak Kumar Rout | Scientific Assistant - E |
| 4 | Shri Deepankar Dash | Scientific Assistant - C |
| 5 | Shri Susanta Kumar Parida | Technician-C |
| 6 | Shri Bikash Chandra Behera | Technician-C |
| 7 | Shri Ramprasad Panigrahi | Technician-C |
| 8 | Dr. Shyamasree Basu | Scientific Officer 'F' |
| 9 | Shri SK Safatulla | Technician-B (Library) |
| 10 | Dr. Sudakshina Prusty | Scientific Officer 'F' |
| 11 | Smt. Anuradha Das | Technician-D |
| 12 | Shri Sanjaya Kumar Mishra | Technician-C |
| 13 | Shri Alok Kumar Jena | Technician-C |
| 14 | Shri Deepak Kumar Behera | Technician-C |
| 15 | Shri Rudranarayan Mohanty | Technician-C |
| 16 | Shri Pravakar Mallick | Technician-C |
| 17 | Shri V.A. Sakthivel | Technician-C |
| 18 | Kum. Suchismita Dash | Technician-D (Library) |
| 19 | Shri Rabindra Kumar Maharana | Technician-D (Library) |
| 20 | Dr. Gunda Santosh Babu | Scientific Officer 'E' |
| 21 | Shri Subhransu Sekhar Panda | Technician-C |
| 22 | Shri Mukesh Kumar Meena | Technician-C |
| 23 | Dr. Arun Kumar | Scientific Officer 'F' |
| 24 | Shri Amit Sankar Sahu | Technician-C |
| 25 | Dr. Saurabh Chawla | Scientific Officer 'D' |
| 26 | Shri Souvagya Mahapatra | Scientific Officer 'D' Civil |
| 27 | Shri Dilip Jha | Scientific Officer 'D' Electrical |
| 28 | Shri Saikat Hira | Scientific Officer 'F' |
| 29 | Shri Amit Kumar Panigrahi | Scientific Assistant 'D' |
| 30 | Shri Bhagaban Dhal | Scientific Assistant 'D' |
| 31 | Shri Pramod Kumar Nath | Scientific Assistant 'D' |
| 32 | Shri Binod Bhagat | Scientific Assistant 'D' |
| 33 | Dr. Ranbir Singh | Scientific Officer 'D' |
| 34 | Shri Sujit Kumar Raut | Scientific Assistant 'B' |
| 35 | Shri Ajit Kumar Mohanty | Scientific Assistant 'B' |
| 36 | Shri Srikrushna Sahu | Technician-B |
| 37 | Shri Debasis Das | Technician-B |
| 38 | Kum. V Shiny Jerusha Joseph | Technician-B |
| 39 | Smt. Ashwini Babrubahan Sethi | Technician-B |
| 40 | Dr. Saralasrita Mohanty | Scientific Officer 'D' |
| 41 | Shri Prakash Chandra Behera | Technician-B |
| 42 | Shri Prafulla Kumar Sethi | Technician-C |
| 43 | Shri Rakesh Kumar Behera | Technician-B |
| 44 | Shri Kuna Mahara | Technician-B |
| 45 | Shri Sandeep Kumar Behera | Technician-B |

| Sl. No. | Name of Employees | Designation |
|---|---|---|
| 46 | Shri Ananda Raman | Scientific Officer 'D' |
| 47 | Dr. Priyanka Pandey | Scientific Officer 'C' |
| 48 | Shri Balaji Venkatesan | Technician-C |
| 49 | Shri Mriganka Sadhukhan | Technician-C |
| 50 | Dr. Biswajit Mishra | Scientific Officer 'D' Medical |
| 51 | Shri Bidyut Siba Sankar Mohanty | Scientific Assistant 'B' |
| 52 | Shri Alok Sahoo | Scientific Assistant 'B' |
| 53 | Shri Tapan Kumar Panigrahi | Technician-C |
| 54 | Dr. Varchaswi K S Kashyap | Scientific Officer 'D' |
| 55 | Dr. Chandramohan Bathrachalam | Scientific Officer 'C' |
| 56 | Dr. Bandita Dash | Scientific Officer 'D' Medical |
| 57 | Dr. Haraprasanna Lenka | Scientific Officer 'D' |
| 58 | Shri M Suryanarayan | Scientific Assistant 'C' PET |
| 59 | Dr. Rashmi Ranjan Guru | Scientific Officer 'C' Medical |
| 60 | Dr. Ajay Kumar Dash | Scientific Officer 'C' |
| 61 | Shri Ashank Vishwakarma | Scientific Officer 'C' Mechanical |

## Emplyee data on SC, ST, OBC and PWD of NISER as on 31.03.2019

**Academic**

| SC | ST | OBC | PWD |
|---|---|---|---|
| 01 | Nil | 12 | Nil |

**Non-Academic**

| SC | ST | OBC | PWD |
|---|---|---|---|
| 11 | 6 | 15 | Nil |

# NATIONAL INSTITUTE OF SCIENCE EDUCATION AND RESEARCH BHUBANESWAR

(An Autonomous Institute under Department of Atomic Energy
Government of India)


## AUDITED STATEMENT OF ACCOUNTS & STATUTORY AUDITOR'S REPORT FOR THE FINANCIAL YEAR : 2018-2019

150
YEARS OF
CELEBRATING
THE MAHATMA

P K NAYAK & CO.
Chartered Accountants

446 – SAHID NAGAR
BHUBANESWAR – 751 007
Phone: 0674-2547560 / 2545560
Fax : 0674 - 2545491
E-mail: pknayakco@yahoo.com

# INDEPENDENT AUDITORS' REPORT

**TO**
**THE MEMBERS**
**National Institute of Science Education and Research ,**
**P.O: Jatni, Dist:Khurda,Odisha**
**PIN-752050**

We have audited the accompanying financial statements of National Institute of Science Education and Research ('The Institute'), which comprise the Balance Sheet as at 31 March 2019, the Income and Expenditure account and the cash Receipt & Payment account for the year then ended, and a summary of significant accounting policies and other explanatory information.

**Management's Responsibility for the Standalone Financial Statements**

The management is responsible for the preparation of these financial statements that give a true and fair view of the financial position, financial performance of the Institute in accordance with the accounting principles generally accepted in India. This responsibility also includes maintenance of adequate accounting records for safeguarding the assets of the Institute and for preventing and detecting frauds and other irregularities; selection and application of appropriate accounting policies; making judgments and estimates that are reasonable and prudent; and design, implementation and maintenance of adequate internal financial controls, that were operating effectively for ensuring the accuracy and completeness of the accounting records, relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

**Auditor's Responsibility**

Our responsibility is to express an opinion on these financial statements based on our audit. We have taken into account the accounting and auditing standards generally accepted in India.

We conducted our audit in accordance with the Standards on Auditing issued by the Institute of Chartered Accountants of India. Those Standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and the disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal financial control relevant to the Institute's preparation of the financial statements that give a true and fair view in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on whether the Institute has in place an adequate internal financial controls system over financial reporting and the operating effectiveness of such controls. An audit also includes evaluating the appropriateness of the accounting policies used and the reasonableness of the accounting estimates made by the Institute as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion on the standalone financial statements.

P.K. NAYAK & CO.

P. K. NAYAK & CO.

**Opinion**
In our opinion and to the best of our information and according to the explanations given to us, the aforesaid financial statements give the information required by the Act in the manner so required and give a true and fair view in conformity with the accounting principles generally accepted in India,

**Further to our observations annexed hereto, we report as follows:**

1. We have obtained all the information and explanations, which to the best of our knowledge and belief were necessary for the purpose of our audit.

2. In our opinion proper books of accounts have been kept by the Institute so far as appears from our examination of those books.

3. The Balance Sheet and the Income and Expenditure Account dealt with by this report are in agreement with the books of accounts maintained by the Institute.

4. In our opinion and to the best of our information and according to explanations given to us the said accounts give a true and fair view:

   (i) In the case of the Balance Sheet, of the state of affairs of the Institute as at 31st March, 2019.

   **AND**

   (ii) In the case of Income and Expenditure Account of the excess of Expenditure over income for the year ended on that date.



For **P. K. NAYAK & CO.**
Chartered Accountants
FRN - 318155E

P.K. NAYAK & CO. BHUBANESWAR CHARTERED ACCOUNTANTS

Sucanta Kumar Sahoo

**(CA. S.K.SAHOO)**
Partner
M. No. 060588

UDIN 19060588AAAABY6791

Place : Bhubaneswar
Date: 30.07.2019

**National Institute of Science Education and Research, Bhubaneswar**
(Under the Deptt.of Atomic Energy, Govt.of India)

**ANNUAL ACCOUNTS 2018- 19**

## BALANCE SHEET AS AT 31ST MARCH, 2019

Amount in Rs.

| Particulars | Schedule | As at 31st March, 2019 | As at 31st March, 2018 |
|---|---|---|---|
| **CORPUS/CAPITAL FUND AND LIABILITIES** | | | |
| CORPUS/CAPITAL FUND | 1 | 8,09,54,38,796 | 8,54,65,88,872 |
| RESERVES AND SURPLUS | 2 | - | - |
| EARMARKED/ENDOWMENT FUNDS | 3 | - | - |
| SECURED LOANS AND BORROWINGS | 4 | - | - |
| UNSECURED LOANS AND BORROWINGS | 5 | - | - |
| DEFERRED CREDIT LIABILITIES | 6 | - | - |
| CURRENT LIABILITIES AND PROVISIONS | 7 | 15,11,51,404 | 12,26,16,187 |
| **TOTAL Rs.** | | **8,24,65,90,200** | **8,66,92,05,059** |
| **ASSETS** | | | |
| FIXED ASSETS | 8 | 7,00,64,55,528 | 1,77,72,99,641 |
| INVESTMENTS- FROM EARMARKED/ENDOWMENT FUNDS | 9 | - | - |
| INVESTMENTS-OTHERS | 10 | 20,21,24,908 | 6,29,72,523 |
| CURRENT ASSETS, LOANS, ADVANCES ETC. | 11 | 1,03,80,09,764 | 6,82,89,32,895 |
| MISCELLANEOUS EXPENDITURE (to the extent not written off or adjusted) | | - | - |
| **TOTAL Rs.** | | **8,24,65,90,200** | **8,66,92,05,059** |
| SIGNIFICANT ACCOUNTING POLICIES | 24 | | |
| CONTIGENT LIABILITIES AND NOTES ON ACCOUNTS | 25 | | |

As per our report of even date attached

For **P. K. NAYAK & CO.**
Chartered Accountants
FRN 318155E

**(CA. S.K.Sahoo)**
Partner
M. No. 060588

Officer on Special Duty
Finance

Finance Officer

Director

Date: 30.07.2019
Place: Bhubaneswar

**National Institute of Science Education and Research, Bhubaneswar**
**(Under the Deptt.of Atomic Energy, Govt.of India)**

**ANNUAL ACCOUNTS** **2018 -19**

## INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2019

Amount in Rs.

| Particulars | Schedule | For the Year Ended 31st March, 2019 | For the Year Ended 31st March, 2018 |
|---|---|---|---|
| **INCOME** | | | |
| Income from Sales/ Services | 12 | - | - |
| Grant / Subsidies | 13 | 88,00,00,000 | 99,15,91,348 |
| Fees / Subscriptions | 14 | 1,78,17,402 | 1,50,67,261 |
| Income from Investment | 15 | - | - |
| Income from Royalty, Publication etc. | 16 | | - |
| Interest Earned | 17 | 2,89,92,280 | 2,25,38,958 |
| Other Income | 18 | - | - |
| Increase/(decrease) in stock of Finished goods and work-in-progress | 19 | - | - |
| **TOTAL(A)** | | **92,68,09,682** | **1,02,91,97,567** |
| **EXPENDITURE** | | | |
| Establishment Expenses | 20 | 52,41,89,547 | 48,36,56,200 |
| Other Administrative Expenses etc. | 21 | 25,13,58,244 | 26,14,84,671 |
| Expenditure on Grants, Subsidies etc. | 22 | - | - |
| Interest | 23 | - | - |
| Depreciation(Net total at the year-end-corresponding to Schedule 8) | | 60,23,09,428 | 14,39,69,349 |
| **TOTAL(B)** | | **1,37,78,57,218** | **88,91,10,220** |
| **Balance being excess of Expenditure over Income(A-B)** | | (45,10,47,536) | 14,00,87,347 |
| Add/Less: Prior Period Expenditure | | 1,02,540 | 26,22,136 |
| **BALANCE BEING SURPLUS/(DEFICIT) CARRIED TO CORPUS/CAPITAL FUND** | | **(45,11,50,076)** | **13,74,65,211** |
| SIGNIFICANT ACCOUNTING POLICIES | 24 | | |
| CONTIGENT LIABILITES AND NOTES ON ACCOUNTS | 25 | | |

As per our report of even date attached

For **P. K. NAYAK & CO.**
Chartered Accountants
FRN - 318155E

(CA. S.K.Sahoo)
Partner
M. No. 060588

Officer on Special Duty
Finance

Finance Officer

Director

Date:30.07.2019
Place: Bhubaneswar

**National Institute of Science Education and Research, Bhubaneswar**
(Under the Deptt.of Atomic Energy, Govt.of India)

**ANNUAL ACCOUNTS** **2018- 19**

## RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD FROM 1ST APRIL,2018 TO 31ST MARCH, 2019

Amount in Rs.

| RECEIPTS | For the Year Ended 31st March, 2019 | For the Year Ended 31st March, 2018 | PAYMENTS | For the Year Ended 31st March, 2019 | For the Year Ended 31st March, 2018 |
|---|---|---|---|---|---|
| **I.Opening Balances** | | | **I. Expenses** | | |
| | | | **a) Establishment Expenses** | | |
| a) Cash in Hand | - | 27 | (corresponding to Schedule 20) | | |
| b) Bank Balances: | | | i. Pay and Allowances | 36,07,16,095 | 33,12,66,423 |
| i) In current accounts | 90,02,80,727 | 61,78,53,298 | ii. Manpower (Outsourced) | | |
| ii) In deposit accounts | - | - | iii. Staff Welfare Expenses | | |
| iii) In Savings accounts | 34,62,16,500 | 33,85,24,600 | iv. Other Expenditure | | |
| | | | v. New Pension Contribution | | |
| | | | **b) Administrative Expenses** | | |
| **II. Grants Received** | | | **(corresponding to Schedule 21)** | | |
| a) From Government of India | 88,00,00,000 | 1,43,64,00,000 | i. Laboratory Consumable | | |
| b) From State Government | - | - | ii.Computer Consumables | | |
| c) From other sources | - | - | iii. Rent, Rates & Taxes | | |
| | | | iv. Duties & Taxes | | |
| **III. Income on Investments** | - | - | v. Other Expenditure | 27,69,64,057 | 26,32,49,383 |
| | | | vi. Prior Period Expenses | 96,000 | 72,000 |
| **IV. Interest Received** | | | vii. Niser XII plan | 4,90,47,404 | 5,41,15,912 |
| On Bank Deposits | 5,14,84,306 | 4,99,37,791 | | | |
| | | | **II. Payments made against funds for various projects** | | |
| **V. Other Income** | | | | | |
| a) Registration Fee ( Msc & Phd ) | 10,32,545 | 10,58,545 | | | |
| b) Job Application Fee | 1,26,500 | 63,000 | **III. Investments and deposits made** | | |
| c) Summer course fee | 1,44,500 | 64,500 | | | |
| | | | **IV. Expenditure on Fixed Assets & Capital Work- in- progress** | | |
| d) RTI Application Fees | 336 | 490 | | | |
| e) Sale of Tender paper | 2,84,120 | 3,14,350 | a) Purchase of Fixed Assets | 45,55,10,940 | 54,46,48,918 |
| f) Guest House Rent | 12,21,805 | 8,21,910 | b) Expenditure on Capital WIP | - | 1,86,12,208 |
| g) License Fees | 15,47,067 | 11,08,175 | | | |
| h) Misc. Receipt | - | 5,000 | **V. Refund of Surplus money/loans** | | |
| i) Transcript Fees | 31,300 | 26,500 | | | |
| j) Identity Card/Health Card(Deplicate) Fee | 3,125 | 3,000 | **VI.Finance Charges(Interest)** | 2,25,38,958 | 2,74,09,939 |
| k) Lease Rent | 5,09,452 | 1,45,376 | | | |
| l) Water Charges | 94,516 | - | **VII. Other Payments** | | |
| | | | a) Sundry Creditors | | - |
| | | | b) Samrt City Fund | 7,350 | 9,676 |
| | | | c ) Alumni Association Subscription | 12,599 | 200 |
| | | | d)License Fees | - | 404 |
| | | | e) Tender Paper Cost | - | 10,000 |
| | | | f) NISER R&D | 66,734 | 10,324 |
| | | | g) IOAA - 2016 | 98,962 | 7,44,304 |
| **VI. Amount Borrowed** | | | h) Deposit (Asset) (LC) | 35,30,63,288 | 20,80,06,775 |
| | | | i) Deans Allowance Receivable | 66,000 | 66,000 |
| **VII. Any other receipts (Loans, Advances & Expenses Recovered)** | | | j) Prepaid Expenses | | - |
| a) Security Deposit | 25,85,545 | 24,89,496 | k) Newspaper & Magazine | | - |
| b) E.M.D | 24,82,078 | 7,45,997 | l)Security Deposit ( Refundable ) | 14,29,497 | 22,60,469 |
| c) Fixed Assets | 31,054 | 1,96,13,515 | m) Duties & Taxes | 5,35,81,175 | 4,70,80,176 |
| d) Prior Period Income | - | - | n) EMD | 7,10,284 | 19,64,142 |
| e) Duties & Taxes | 5,47,41,067 | 4,65,11,901 | o ) prior period expenses | | - |
| f) CSIR FUND | 27,398 | 4,18,720 | p) Scholarship Ashutosh Payable | | - |
| | | | q) Statutory Recoveries | 2,33,20,758 | 2,46,49,128 |
| | | | r) Student Dues | 25,09,425 | 13,41,618 |
| g) DST INSPIRE Payable | - | 1,589 | s) Registration Fee ( Msc & Phd ) | | 1,29,860 |
| h) Statutory Recoveries | 2,35,53,832 | 2,47,16,177 | t) Loans & Advance (Asset) | 1,36,78,848 | 1,53,17,476 |
| i) Student Dues | 1,63,62,811 | 1,32,63,085 | u) Abhash Jha NBHM TA Claim | | - |
| | | | v ) Mr. Vanatri Siva TA Bill (SERB) | | - |
| j) Hindi Sangoshthi | - | 1,50,000 | w ) Liabilities for Expenses | 9,26,94,204 | 8,15,79,745 |
| k) Odisha State Fund | - | 43,805 | x) Scholarship Receivable | 40,58,210 | 2,04,85,082 |
| l) Smart City Fund | | 20,000 | y) Guest House Rent | | - |
| | | | z) Hindi Sangoshthi | 1,50,000 | - |
| m) Deposit (Asset) (LC) | 21,87,65,698 | 28,64,42,631 | | | |
| n) Loans & Advance (Asset) | 1,49,67,183 | 1,02,24,932 | | | |
| | | | **VIII. Closing Balances** | | |
| o) Scholarship Receivable | 72,37,807 | 1,73,96,191 | a) Cash in hand | - | - |
| | | | b) Bank Balances: | | |
| p ) Vigyan Prabha-DAE Project | 50,00,000 | - | i) In current accounts | 55,22,95,009 | 90,02,80,727 |
| q) NISER R& D Receivable | 55,851 | 13,62,797 | ii) in deposit accounts | - | - |
| | | | iii) In savings accounts | 26,51,71,326 | 34,62,16,500 |
| **TOTAL Rs.** | **2,52,87,87,123** | **2,86,95,27,389** | **TOTAL Rs.** | **2,52,87,87,123** | **2,86,95,27,389** |

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For P. K. NAYAK & CO.
Chartered Accountants
FRN - 318155E
Sucanta
(CA. S.K.Sahoo)
Partner
M. No. 060588

Date:30.07.2019
Place: Bhubaneswar

P.K. NAYAK & CO. S.K. Sahoo BHUBANESWAR CHARTERED ACCOUNTANTS

Officer on Special Duty
Finance

Finance Officer

Director

**National Institute of Science Education and Research, Bhubaneswar**
**(Under the Deptt.of Atomic Energy, Govt.of India)**

## ANNUAL ACCOUNTS 2018- 19

**Schedule -1 : Corpus / Capital Fund**
( Schedule forming part of Balance Sheet as at 31.03.2019)

Amount in Rs.

| Particulars | Current Year(2018-19) | | Previous Year(2017-18) | |
|---|---|---|---|---|
| Balance as at the beginning of the year | 8,21,07,00,000 | | 8,01,07,00,000 | |
| Add: Contribution towards Corpus/Capital Fund | - | | 20,00,00,000 | |
| Add: XII Plan New Project | 1,32,83,46,000 | | 1,32,83,46,000 | |
| Advance Materials for Different applications Grant | 14,30,00,000 | | 14,30,00,000 | |
| Basic Research in Cellular and Moducular Grant | 14,76,00,000 | | 14,76,00,000 | |
| Centre for Fundamental Studies Grant | 3,72,96,000 | | 3,72,96,000 | |
| Centre for inter Disciplinary Sciences Grant | 28,63,00,000 | | 28,63,00,000 | |
| Experimental Condensed Matter Ultra Cold Atom Grant | 28,05,00,000 | | 28,05,00,000 | |
| Experimental High Energy Physics Programme Grant | 3,42,00,000 | | 3,42,00,000 | |
| Microbes Immunity and Rearch Biology Grant | 14,19,00,000 | | 14,19,00,000 | |
| Novel Organic Compounds for Boimedical Grant | 14,52,00,000 | | 14,52,00,000 | |
| Outreach Programmes in Maths and Systems Biology Grant | 34,50,000 | | 34,50,000 | |
| Research in Basic Sciences Grant | 5,00,00,000 | | 5,00,00,000 | |
| Theoretical High Energy and Condensed Matter Grant | 5,89,00,000 | | 5,89,00,000 | |
| Less: Grant Transferred to Revenue | 17,61,97,309 | | 17,61,97,309 | |
| | | 9,36,28,48,691 | | 9,36,28,48,691 |
| Add/(Deduct): Balance of net income/ (expenditure) transferred from the Income and Expenditure Account | - | (1,26,74,09,895) | - | (81,62,59,819) |
| Balance as at the year end Total Rs. | | 8,09,54,38,796 | | 8,54,65,88,872 |

**Schedule -2 : Reserves & Surplus**
( Schedule forming part of Balance Sheet as at 31.03.2019)

| Particulars | Current Year(2018-19) | | Previous Year(2017-18) | |
|---|---|---|---|---|
| 1. Capital Reserve: | | | | |
| As per last Account | - | | - | |
| Addition during the year | - | | - | |
| Less: Deduction during the year | - | - | - | - |
| 2. Revaluation Reserve | | | | |
| As per last Account | - | | - | |
| Addition during the year | - | | - | - |
| Less: Deduction during the year | - | - | - | |
| 3. Special Reserve | | | | |
| As per last Account | - | | - | |
| Addition during the year | - | | - | |
| Less: Deduction during the year | - | - | - | - |
| 4. General Reserve | | | | |
| As per last Account | - | | - | |
| Addition during the year | - | | - | |
| Less: Deduction during the year | - | - | - | - |
| TOTAL Rs. | | - | | - |

For P. K. NAYAK & CO.
Chartered Accountants
FRN - 318155E

(CA. S.K.Sahoo)
Partner
M. No. 060588

Officer on Special Duty
Finance

Finance Officer

Director

**Schedule -3 : Earmarked/Endowment Fund**

( Schedule forming part of Balance Sheet as at 31.03.2019)

| Particulars | Fund-wise break up | | | | | | | | Totals | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fund WW | | Fund XX | | Fund YY | | Fund ZZ | | Current Year(2018-19) | | Previous Year(2017-18) | |
| a) Opening balance of the funds | | - | | - | | - | | - | | - | | - |
| b) Additions to the funds: | | | | | | | | | | | | |
| i. Donations/grants | - | | - | | - | | - | | - | | - | |
| ii. Income from Investments made on account of funds | - | | - | | - | | - | | - | | - | |
| iii. Other additions | - | - | - | - | - | - | - | - | - | - | - | - |
| TOTAL Rs. ( a + b) | | - | | - | | - | | - | | - | | - |
| c) Utilisation/Expenditure towards objectives of funds | | | | | | | | | | | | |
| i. Capital Expenditure | | | | | | | | | | | | |
| Fixed Assets | - | | - | | - | | - | | - | | - | |
| Others | - | | - | | - | | - | | - | | - | |
| Total | | - | | - | | - | | - | | - | | - |
| ii. Revenue Expenditure | | | | | | | | | | | | |
| Salaries, Wages and allowances | - | | - | | - | | - | | - | | - | |
| Rent | - | | - | | - | | - | | - | | - | |
| Other Administrative expenses | - | | - | | - | | - | | - | | - | |
| Total | | - | | - | | - | | - | | - | | - |
| TOTAL Rs. (c) | | - | | - | | - | | - | | - | | - |
| Net Balance at the year end ( a+b-c) | | - | | - | | - | | - | | - | | - |

For P. K. NAYAK & CO.
Chartered Accountants
FRN - 318155E

(CA. S.K.Sahoo)
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M. No. 060588

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Finance

Finance Officer

Director

**National Institute of Science Education and Research, Bhubanes**

**(Under the Deptt.of Atomic Energy, Govt.of India)**

## ANNUAL ACCOUNTS 2018- 19

**Schedule -4 : Secured Loans and Borrowings**

( Schedule forming part of Balance Sheet as at 31.03.2019)

Amount in Rs.

| Particulars | Current Year(2018-19) | | Previous Year(2017-18) | |
|---|---|---|---|---|
| 1. Central Government | | - | | - |
| 2. State Government (Specify) | | - | | - |
| 3. Financial Institutions | | | | |
| a) Term Loans | - | | - | |
| b) Interest accured and due | - | - | - | - |
| 4. Banks: | | | | |
| a) Term Loans | - | | - | |
| Interest accured and due | - | | - | |
| b) Other Loans (specify) | - | | - | |
| Interest accured and due | - | - | - | - |
| 5. Other Institutions and Agencies | | - | | - |
| 6. Debenture and Bonds | | - | | - |
| 7. Others(specify) | | - | | - |
| TOTAL Rs. | | - | | - |

For **P. K. NAYAK & CO.**
Chartered Accountants
FRN - 318155E

**(CA. S.K.Sahoo)**
Partner
M. No. 060588

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Finance

Finance Officer

Director

**National Institute of Science Education and Research, Bhubaneswa**
**(Under the Deptt.of Atomic Energy, Govt.of India)**

## ANNUAL ACCOUNTS 2018- 19

**Schedule -5 : Unsecured Loans and Borrowings**
( Schedule forming part of Balance Sheet as at 31.03.2019)

Amount in Rs.

| Particulars | Current Year(2018-19) | | Previous Year(2017-18) | |
|---|---|---|---|---|
| 1. Central Government | | - | | - |
| 2. State Government (Specify) | | - | | - |
| 3. Financial Institutions | | - | | - |
| 4. Banks: | | | | |
| a) Term Loans | - | | - | |
| b) Other Loans (specify) | - | - | - | - |
| 5. Other Institutions and Agencies | | - | | - |
| 6. Debenture and Bonds | | - | | - |
| 7. Fixed Deposits | | | | |
| 8. Others(specify) | | - | | - |
| TOTAL Rs. | | - | | - |

**Schedule -6 : Deferred Credit Liabilities**
( Schedule forming part of Balance Sheet as at 31.03.2019)

Amount in Rs.

| Particulars | Current Year(2018-19) | Previous Year(2017-18) |
|---|---|---|
| a) Acceptances secured by hypothecation of capital equipment and other assets | - | - |
| b) Others | - | - |
| TOTAL Rs. | - | - |

For **P. K. NAYAK & CO.**
Chartered Accountants
FRN - 318155E

**(CA. S.K.Sahoo)**
Partner
M. No. 060588

Officer on Special Duty
Finance

Finance Officer

Director

**National Institute of Science Education and Research, Bhubaneswar**
(Under the Deptt.of Atomic Energy, Govt.of India)

## ANNUAL ACCOUNTS 2018-19

**Schedule -7 : Current Liabilities and Provisions**
( Schedule forming part of Balance Sheet as at 31.03.2019)

Amount In Rs.

| S.No. | Particulars | Current Year(2018-19) | | Previous Year(2017-18) | |
|---|---|---|---|---|---|
| A. | CURRENT LIABILITIES | | | | |
| 1. | Acceptances | | - | | - |
| 2. | Sundry Creditors: | | | | |
| | a) For Goods | 2,87,653 | | 2,87,653 | |
| | b) Others - EMD | 77,30,734 | | 59,52,400 | |
| | | | 80,18,387 | | 62,40,053 |
| 3. | Advances Received | | - | | - |
| 4. | Interest accured but not due on: | | | | |
| | a) Secured loans/borrowings | | - | | - |
| | b) Unsecured Loans/borrowings | | - | | - |
| 5. | Statutory Liabilities | | | | |
| | a) Overdue | | - | | - |
| | b) Others | | | | |
| | TDS (Non Salary) | 5,30,220 | | 96,446 | |
| | TDS (CGST) | 2,51,855 | | | |
| | TDS (SGST) | 2,51,855 | | | |
| | TDS (IGST) | 2,00,462 | | | |
| | TDS (Salary) | 15,258 | | (10,202) | |
| | | | 12,49,650 | | 86,244 |
| 6. | Other Current Liabilities | | | | |
| a) | Student Dues | | | | |
| | Internal amenitie S.D. | 1,84,000 | | 1,86,000 | |
| | Excess Prog. Regd. Fees | 11,517 | | 12,667 | |
| | Caution Money (Labrotary) | 13,000 | | 13,000 | |
| | Caution Money (Library) | 16,68,000 | | 14,12,000 | |
| | Caution Money (Institute) | 28,63,250 | | 24,15,250 | |
| | Caution Money (Hostel) | 94,000 | | | |
| | CSIR FUND | - | | 4,18,720 | |
| | Smart City Fund | 2,974 | | 10,324 | |
| | Hindi Sangoshthi | - | | 1,50,000 | |
| | DST INSPIRE Payable | - | | 1,580 | |
| | Odisha State Fund | 43,805 | | 43,805 | |
| | Alumuni Association Subscription | 82,001 | | 47,000 | |
| | Vigyan Pratibha-DAE Project | 50,00,000 | | - | |
| | Programme Registration | 2,77,050 | | 2,77,050 | |
| | Student Welfare Fund | 2,49,440 | | 2,01,840 | |
| | IOAA -2016 | 63,18,849 | | 64,17,811 | |
| | | | 1,68,07,886 | | 1,16,07,047 |
| b) | Security Deposit | | | | |
| | Thames Consultant Pvt. Ltd. | 22,722 | | 22,722 | |
| | Jena Travels | - | | 1,01,000 | |
| | Airway Bhubaneswar | 28,000 | | 28,000 | |
| | Ashok Kumar Nayak | 5,000 | | 5,000 | |
| | Anirudha Mohapatra | - | | 65,147 | |
| | Amarendra Ojha | 2,66,354 | | 61,188 | |
| | 4S Interiors | 25,39,832 | | 25,39,832 | |
| | Bigyan Kumar Pradhan | 1,54,044 | | 1,29,782 | |
| | Bijay Kumar Behera | 2,29,074 | | 1,26,313 | |
| | Bhagarathi Sahoo | 1,27,745 | | 1,22,193 | |
| | B K Giri | 18,133 | | 18,133 | |
| | Indo Electricals | 16,666 | | - | |
| | Firestop sales and services | 2,748 | | - | |
| | Biswajeet Kandi | 35,879 | | - | |
| | Deepak Kumar Mishra | 27,496 | | 51,841 | |

P.K.NAYAK & CO. BHUBANESWAR CHARTERED ACCOUNTANTS

**National Institute of Science Education and Research, Bhubaneswar**
**(Under the Deptt.of Atomic Energy, Govt.of India)**

**ANNUAL ACCOUNTS** **2018- 19**

**Schedule -7 : Current Liabilities and Provisions**
( Schedule forming part of Balance Sheet as at 31.03.2019)

Amount In Rs.

| S.No. | Particulars | Current Year(2018-19) | | Previous Year(2017-18) | |
|---|---|---|---|---|---|
| | Geeken Seating Collection Pvt. Ltd. | 55,36,542 | | 55,36,542 | |
| | Biplab Kumar Parida | 45,935 | | - | |
| | HAK Electrical & Engineering Works | 2,25,484 | | 76,693 | |
| | H Electrical Engg. Works | 16,439 | | 16,439 | |
| | Jagannath Refrigeration Services | 3,200 | | 3,200 | |
| | Shri Rabindra Kumar Mallick | 6,515 | | 93,670 | |
| | Subhashree Engineering | 4,890 | | 4,890 | |
| | Pest Control India Pvt. Ltd. | 360 | | 360 | |
| | Biswajit Mishra | 1,26,694 | | 1,26,694 | |
| | Nirmal Chandra Sar | 2,81,296 | | 2,97,451 | |
| | Numeric Power Systems Ltd. | 14,343 | | 14,343 | |
| | Deepak Kumar Das | 68,934 | | 1,00,739 | |
| | Laser Science Services (I) Pvt Ltd | 4,50,900 | | 4,50,900 | |
| | Laxman Senapati | 66,004 | | 1,26,231 | |
| | Maa Dakhilachandi Catering Services | 1,00,000 | | 1,00,000 | |
| | Barnali Bera | 80,886 | | 34,317 | |
| | Bichitrananda Samantaray | 1,07,198 | | 30,600 | |
| | Bikramajit Singh | 5,000 | | 5,000 | |
| | Chandan Electrical | 10,000 | | 10,000 | |
| | Debasis Pattanaik | 2,08,580 | | 1,62,000 | |
| | Dwarika Nath Samal | - | | 3,02,571 | |
| | Ensure Support Services India Ltd | 5,000 | | 5,000 | |
| | Everest Computers | 5,000 | | 5,000 | |
| | IN2IT Technology Pvt. Ltd | 5,000 | | 5,000 | |
| | J N Sarma | 1,00,000 | | 1,00,000 | |
| | JOHNSON | 1,30,504 | | 1,30,504 | |
| | Kumar Electricals | 5,000 | | 5,000 | |
| | Manor Computers | 5,000 | | 5,000 | |
| | Maxim Systems | 5,000 | | 5,000 | |
| | Nablok Das | 1,13,951 | | 60,909 | |
| | Ray Electricals | 1,36,987 | | 19,015 | |
| | Santosh Kumar Paikaray | 5,000 | | 5,000 | |
| | S P Power System | 13,975 | | 13,975 | |
| | Suvidha Engineers Pvt. Ltd | 1,15,644 | | 1,15,644 | |
| | Vedica Resources | 25,287 | | 25,107 | |
| | Wizertech informatices Pvt. Ltd | 5,000 | | 5,000 | |
| | AS Associates | 84,321 | | - | |
| | Sai Aircon | 9,509 | | 9,509 | |
| | Sanjeeb Kumar Das | 5,000 | | 5,000 | |
| | Sridhar Routray | 5,000 | | 5,000 | |
| | Sritam Computers | 3,66,997 | | 2,16,597 | |
| | Sujit Kumar Nahak | 44,579 | | 44,579 | |
| | Indu Enterprises | 19,783 | | - | |
| | Mangaraj Hati | 1,27,111 | | - | |
| | Maratha engineerings and suppliers | 19,641 | | - | |
| | Namaha Shivaya Enterprise | 2,00,260 | | - | |
| | Rabindra Electricals | 17,000 | | - | |
| | Saraj Kumar Das | 21,230 | | - | |
| | Shree Maa Constructions | 1,14,000 | | - | |
| | Shreema Construction | 60,039 | | - | |
| | Sonatech Infosolutions pvt. Ltd. | 32,822 | | - | |
| | VL Access india pvt. Ltd. | 5,000 | | | |
| | Tathagata Engineering | 3,12,681 | | 2,48,536 | |
| | | | 1,29,54,214 | | 1,17,98,166 |
| c) | Other Payables | | | | |
| | CHSS | 1,55,679 | | - | |
| | Flag day recovery | 3,000 | | - | |
| | Court Case ofSouvagya Mahapatra | - | | 13,000 | |
| | CPF/ GPF/ PRMS (Deputation V. Chandrasekhar) | - | | (150) | |
| | NPS Recovery | 1,60,939 | | 74,519 | |
| | Professional Tax | 1,640 | | 815 | |
| | | | 3,21,258 | | 88,184 |
| | TOTAL Rs. (A) | | 3,93,51,395 | | 2,98,19,694 |

**National Institute of Science Education and Research, Bhubaneswar**
(Under the Deptt.of Atomic Energy, Govt.of India)

**ANNUAL ACCOUNTS** **2018-19**

**Schedule -7 : Current Liabilities and Provisions**
( Schedule forming part of Balance Sheet as at 31.03.2019)

Amount in Rs.

| S.No. | Particulars | Current Year(2018-19) | | Previous Year(2017-18) | |
|---|---|---|---|---|---|
| 8. | PROVISIONS | | | | |
| | For Taxation | - | | - | |
| | Gratuity | - | | - | |
| | Superannuation / Pension | - | | - | |
| | Accumulated Leave Encashment | - | | - | |
| | Trade Warranties / Claims | - | | - | |
| | For Expenses Payable | | | | |
| | Audit Fees | 50,740 | | 50,740 | |
| | Fellowship | 1,13,61,180 | | 63,78,709 | |
| | Hire Charges Vehicle | 5,02,584 | | 4,58,649 | |
| | Stipend to Trainee Payable | 81,000 | | 60,000 | |
| | Fuel Charges Payable | 17,852 | | 2,11,898 | |
| | House Keeping Expenses Payable | 25,000 | | 90,000 | |
| | Honorarim/Remuneration | 2,89,836 | | 1,82,500 | |
| | Outsourced Manpower | 48,95,068 | | 1,13,90,273 | |
| | Auditorium Complex (WIP) Payable | 13,80,000 | | - | |
| | Medical Expenses | 5,25,660 | | 76,652 | |
| | Advertisement Charges Payable | - | | 7,189 | |
| | Electricity Charges Payable | 34,16,017 | | 75,741 | |
| | Children Educational Allowance Payable | 26,54,700 | | 18,41,097 | |
| | Contingency Expenditure Payable | 4,23,123 | | 5,69,463 | |
| | Hospitality Expenses Payable | 4,66,188 | | 2,25,678 | |
| | Lab Consumable Payable | - | | 28,02,544 | |
| | Leave Travel Concession Payable | - | | 1,93,743 | |
| | Meeting Expenses Payable | - | | 5,11,489 | |
| | Newspaper & Magazine Expenses Payable | 1,509 | | 1,814 | |
| | Printing & Stationary Expenses Payable | 2,970 | | 77,670 | |
| | Postage & telegram Payable | 13,682 | | 19,275 | |
| | Pension Contribution Payable | - | | 5,16,852 | |
| | Leave Salary Contribution Payable | 1,92,689 | | 2,75,403 | |
| | Purchase of Consumable Payable | 33,04,075 | | 11,67,340 | |
| | Rent , Rate & Taxes Payable | - | | 5,296 | |
| | Sports & Internal Activity Expenses Payable | 5,400 | | 24,256 | |
| | Supplies & Materials Payable | 19,95,382 | | 8,71,300 | |
| | TA on Tranfer Payable | - | | 18,867 | |
| | Travelling & Conveyance Payable | 7,13,752 | | 4,75,160 | |
| | Work in Progress Payable | 41,97,654 | | 41,00,970 | |
| | Repair & Maintainance Expenses Payable | 17,71,747 | | 13,60,550 | |
| | Professional update allowance | 48,29,792 | | 49,19,064 | |
| | Pay and Allowances | 2,43,94,778 | | 1,88,35,057 | |
| | Telephone & Telex | 1,63,222 | | 1,26,082 | |
| | PRIS | 1,79,06,273 | | 3,32,10,225 | |
| | Water Charges | 8,400 | | 6,540 | |
| | NPS Employees Subscription | 22,51,295 | | 16,56,487 | |
| | Books Payable | 2,55,943 | | - | |
| | Computer Expenses Payable | 4,12,289 | | - | |
| | Electrical Installation Payable | 10,38,711 | | - | |
| | Furniture and fixtures payable | 11,09,557 | | - | |
| | Horticulture and Plantation Exp. Payable | 46,800 | | - | |
| | Insurance for vehicle payable | 13,063 | | - | |
| | Lab Equipment Payable | 64,44,603 | | - | |
| | Leave encashment Payable | 2,27,184 | | - | |
| | Machinery Equipment Payable | 56,15,709 | | - | |
| | Office Automation Payable | 9,34,052 | | - | |
| | Office Equipment Payable | 32,76,544 | | - | |
| | Outsourced Security Payable | 33,55,219 | | - | |
| | Scholarship Payable | 8,80,000 | | - | |
| | Seminar, Workshop Payable | 1,39,164 | | - | |
| | Transportation charges payable | 21,881 | | - | |
| | IISER/NISER Expenses Payable | 1,28,923 | | - | |
| | Payable to THDC Employer Share | 58,799 | | | |
| | NPS-Receive SERB Delhi | - | | 1,920 | |
| | **Sub-total Rs. (B)** | | **11,18,00,009** | | **9,27,96,493** |
| | **Total Rs. (A+B)** | | **15,11,51,404** | | **12,26,16,187** |

For P. K. NAYAK & CO.
Chartered Accountants
FRN - 318155E

P. K. NAYAK & CO. BHUBANESWAR

**National Institute of Science Education and Research, Bhubaneswar**
(Under the Deptt.of Atomic Energy, Govt.of India)

**ANNUAL ACCOUNTS** 2018 - 19

Schedule -8 : Fixed Assets
( Schedule forming part of Balance Sheet as at 31.03.2019)

Amount in Rs.

| Sl. No. | Particular of Assets | Rate | GROSS BLOCK | | | | | DEPRECIATION | | | NET BLOCK | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | WDV as on 01.04.2018 | Addition during the year | | Deductions ( / (Sale / Adjustt.) during the year | Cost/valuation at the year-end | Depreciation for the year | Deductions during the year | Total upto the year-end | As at the current year-end on 31.03.2019 | As at the Previous year-end on 31.03.2018 |
| | | | | more than 180 days | less than 180 days | | | | | | | |
| 1 | Land | - | 2,76,17,405 | - | - | - | 2,76,17,405 | - | - | - | 2,76,17,405 | 2,76,17,405 |
| 2 | Buildings (Academic) | 10% | - | 2,50,20,50,348 | - | - | 2,50,20,50,348 | 25,02,05,035 | - | 25,02,05,035 | 2,25,18,45,313 | - |
| 3 | Building(Residential) | 5% | - | 2,88,90,44,038 | | | 2,88,90,44,038 | 14,44,52,202 | - | 14,44,52,202 | 2,74,45,91,836 | - |
| 4 | Electrical Installation | 10% | - | 20,80,66,512 | - | - | 20,80,66,512 | 2,08,06,651 | - | 2,08,06,651 | 18,72,59,861 | - |
| 5 | Furniture & Fixtures | 10% | 28,53,15,179 | 44,37,867 | 1,67,62,590 | - | 30,65,15,636 | 2,98,13,434 | - | 2,98,13,434 | 27,67,02,202 | 28,53,15,179 |
| 6 | Computers | 40% | 1,19,84,900 | 1,21,03,730 | 79,14,604 | - | 3,20,03,234 | 1,12,18,373 | - | 1,12,18,371 | 2,07,84,858 | 1,19,84,900 |
| 7 | Software | 40% | 4,28,135 | 1,35,46,220 | 23,15,670 | - | 1,62,90,025 | 60,52,876 | - | 60,52,876 | 1,02,37,149 | 4,28,135 |
| 8 | Lab Equipments | 15% | 45,51,22,656 | 7,68,33,057 | 13,06,16,622 | 51,64,618 | 65,84,64,366 | 8,79,16,760 | - | 8,79,16,760 | 56,94,90,957 | 45,51,22,656 |
| 9 | Tools Equipments | 15% | 1,07,678 | - | - | - | 1,07,678 | 16,152 | - | 16,152 | 91,526 | 1,07,678 |
| 10 | Books | 40% | 51,58,943 | 13,79,008 | 3,04,077 | - | 68,42,028 | 26,75,996 | - | 26,75,996 | 41,66,032 | 51,58,943 |
| 11 | Journals | 40% | 3,07,87,547 | 5,09,92,933 | | - | 8,17,80,480 | 3,27,12,192 | - | 3,27,12,192 | 4,90,68,288 | 3,07,87,547 |
| 12 | Air Conditioners | 15% | 16,17,423 | - | 6,99,570 | - | 23,16,993 | 2,95,081 | - | 2,95,081 | 20,21,912 | 16,17,423 |
| 13 | Vehicles | 15% | 3,46,066 | - | - | - | 3,46,066 | 51,910 | - | 51,910 | 2,94,156 | 3,46,066 |
| 14 | Bicycle | 15% | 2,617 | - | - | - | 2,617 | 393 | - | 393 | 2,224 | 2,617 |
| 15 | Machinery & Equipments | 15% | 9,14,10,527 | 41,63,084 | 1,57,70,147 | - | 11,13,43,758 | 1,55,18,803 | - | 1,55,18,803 | 9,58,24,955 | 9,14,10,527 |
| 16 | EPABX | 15% | 8,187 | - | - | - | 8,187 | 1,228 | - | 1,228 | 6,959 | 8,187 |
| 17 | Kitchen Equipments | 15% | 38,08,920 | - | - | - | 38,08,920 | 5,71,337 | - | 5,71,338 | 32,37,582 | 38,08,920 |
| 18 | Telephones | 10% | 10,066 | - | - | - | 10,066 | 1,007 | - | 1,007 | 9,059 | 10,066 |
| 19 | Capital Assets(WIP) | - | 22,15,56,280 | 61,38,975 | 3,30,39,656 | 25,93,54,911 | 13,80,000 | - | - | - | 13,80,000 | 22,15,56,280 |
| 20 | NISER XII Plan Asset | - | 64,20,17,116 | 4,64,37,370 | 7,33,74,287 | 5,520 | 76,18,23,252 | - | - | - | 76,18,23,252 | 64,20,17,116 |
| | TOTAL Rs. | | 1,77,72,99,641 | 5,81,51,93,141 | 28,07,97,223 | 26,34,68,401 | 7,60,98,21,609 | 60,23,09,429 | - | 60,23,09,428 | 7,00,64,55,528 | 1,77,72,99,641 |

For P. K. NAYAK & CO.
Chartered Accountants
FRN - 318155E

(CA. S.K.Sahoo)
Partner
M. No. 060588

P. K. NAYAK & CO. BHUBANESWAR CHARTERED ACCOUNTANTS

Officer on Special Duty
Finance

Finance Officer

Director

P.O.: Bhimpur - Padanpur, Jatani ,Khurda - 752050, Odisha, India, Phone: 0674-2494008, Fax.: 0674-2494009,
Email: director@niser.ac.in,Web . : www.niser.in

**National Institute of Science Education and Research, Bhuban**
**(Under the Deptt.of Atomic Energy, Govt.of India)**

## ANNUAL ACCOUNTS 2018- 19

**Schedule -9 : Investments from Earmarked/Endowment Funds**
( Schedule forming part of Balance Sheet as at 31.03.2019)

Amount in Rs.

| Particulars | Current Year(2018-19) | Previous Year(2017-18) |
|---|---|---|
| 1. In Government Securities | - | - |
| 2. Other approved Securities | - | - |
| 3. Shares | - | - |
| 4. Debentures and Bonds | - | - |
| 5. Subsidiaries and Joint Ventures | - | - |
| 6. Others (to be specified) | - | - |
| TOTAL | - | - |

**Schedule -10 : Investments-Others**
( Schedule forming part of Balance Sheet as at 31.03.2019)

Amount in Rs.

| Particulars | Current Year(2018-19) | Previous Year(2017-18) |
|---|---|---|
| 1. In Government Securities | - | - |
| 2. Other approved Securities | - | - |
| 3. Shares | - | - |
| 4. Debentures and Bonds | - | - |
| 5. Subsidiaries and Joint Ventures | - | - |
| 6. FD against LC's | 20,21,24,908 | 6,29,72,523 |
| TOTAL Rs. | 20,21,24,908 | 6,29,72,523 |

For **P. K. NAYAK & CO.**
Chartered Accountants
FRN - 318155E

Officer on Special Duty — Finance Officer — Director

(CA. S.K.Sahoo)
Partner
M. No. 060588

Finance

P.K. NAYAK & CO. BHUBANESWAR CHARTERED ACCOUNTANTS

**National Institute of Science Education and Research, Bhubaneswar**
(Under the Deptt.of Atomic Energy, Govt.of India)

**ANNUAL ACCOUNTS** **2018 - 19**

**Schedule -11 : Current Assets, Loans, Advances etc.**
( Schedule forming part of Balance Sheet as at 31.03.2019)

| Particulars | Current Year(2018-19) | | Previous Year(2017-18) | |
|---|---|---|---|---|
| **A. CURRENT ASSETS:** | | | | |
| 1. Inventories: | | | | |
| a) Stores and Spares | - | | - | |
| b) Loose Tools | - | | - | |
| c) Stock-in-trade | | | | |
| Finished goods | - | | - | |
| Work-in-progress | - | | | |
| Raw Materials | - | - | - | - |
| 2. Sundry Debtors: | - | | | |
| a) Debts Outstanding for a period exceeding six months | - | | - | |
| b) Others | - | - | - | - |
| 3. Cash balances in hand | - | - | - | - |
| 4. Bank Balances | | | - | |
| a) SBI A/C - 30755200010 | 55,11,51,982 | | 90,02,80,727 | |
| b) SBI A/C - 37871572767 | 11,43,027 | | - | |
| c) IOB A/C - 373701000000001 | 25,32,97,129 | | 34,17,94,815 | |
| d) IOB A/C -373701000008888 | 42,17,072 | | 40,52,568 | |
| e) IOB A/C -147601000015510 | 78,57,125 | 81,74,66,335 | 3,69,117 | 1,24,64,97,227 |
| 5. Post office Savings Accounts | | - | | - |
| **Total(A)** | | **81,74,66,335** | | **1,24,64,97,227** |
| **B. LOANS, ADVANCES AND OTHER ASSETS:** | | | | |
| **1. a) Staffs:** | | | | |
| Ashish Pandav | 1,13,601 | | - | |
| Avanendra Singh,Ph.D. Student , SPS | - | | 16,200 | |
| Bedangdas Mohanty | 1,30,217 | | - | |
| Dukhishyam Mallick (Student) | 3,03,660 | | - | |
| Debasish Mallick | 1,45,674 | | 1,25,352 | |
| Jaban Meher | - | | 70,233 | |
| Pradeep Kumar Mishra | 17,404 | | 17,404 | |
| Prasanjit Samal | 2,00,000 | | 20,325 | |
| Prolay Kumar Mal | - | | 28,445 | |
| Deepak Srivastav | - | | 3,369 | |
| Vijay Singh | - | | 10,000 | |
| Saurabh Chawla | - | | 74,800 | |
| Pranaya Ku Swain | 1,723 | | 4,760 | |
| Abhay Kumar Naik | - | | 1,500 | |
| Amarendra Das | - | | 88,581 | |
| Debadipti Mishra | - | | 1,25,352 | |
| Debasmita P.A lone | 30,000 | | 1,60,000 | |
| G. Santosh Babu | - | | 9,075 | |
| Kartik Senapati | - | | 2,70,000 | |
| Kishore C S Panigrahi | 3 | | 3 | |
| KVS Baidireenath | 90,000 | | 607 | |
| Manjusha Dixit | - | | 8,182 | |
| Mr Dilip Jha | - | | 6,615 | |
| Mr Ramanujan Srinivasan | - | | 2,153 | |
| Mr. Trailokyanath Sahoo | - | | 84,104 | |
| M Suryanarayan (PET, NISER ) | - | | 1,54,500 | |
| Nirupama Dutta | - | | 15,000 | |
| Nishikanta Khandai | - | | 20,000 | |
| Palok Aich | - | | 2,00,000 | |
| Subhankar Bedanta | - | | 1,40,000 | |
| U Lourderaj , Reader | - | | 64,242 | |
| V A Sakthivel | - | | 865 | |
| Nagendra Kumar Sharma | 1,35,000 | | - | |
| Sanjay Kumar Swain | 3,12,930 | | - | |
| Saurav Kundu-SPS | 6,43,230 | | - | |
| V Ravi Chandra , Reader | - | | 99,000 | |
| Abhaya Kumar Mohanty (Imprest) | 41,649 | | 20,000 | |
| Anil Kumar Karn/Sanjay Parui (Imprest) | - | | 9,466 | |
| Anil Kumar , Chemistry (Imprest)Arun Kumar (SO) | - | | 9,000 | |
| Ashok Mohapatara (Imprest) | - | | 3,074 | |
| Biswajit Mishra (Imprest) | - | | 9,942 | |
| Deepak Kumar Dalai (Imprest) | - | | 10,000 | |
| Deepak Srivastav (Imprest) | - | | 10,000 | |
| Dinesh Bahadur Singh(Imprest) | - | | 4,922 | |
| Kishore CS Panigrahi (Imprest) | - | | 10,000 | |
| P C Ravi Kumar(Imprest) | - | | 5,149 | |
| Praful Singru (Imprest) | 1,015 | | 6,000 | |
| Chandan Goswami | 14,033 | | - | |
| Purna Chadra Sahu (Imprest) | - | | 5,000 | |
| Dr Ranjit Mathew (Imprest) | - | | 3,556 | |
| Saikat Hira SO (Imprest) | - | | 10,000 | |
| Subhankar Bedanta (Imprest) | 10,000 | | 14,925 | |
| Sudha krishna Prusty (Imprest) | - | | 10,000 | |
| Sumedha Warden (Imprest) | - | | 2,607 | |
| Shabnam Khanum(Imprest) | - | | 10,000 | |
| Festival Advance to Staff | 3,600 | | 3,600 | |
| | | 21,93,739 | | 19,77,908 |

**National Institute of Science Education and Research, Bhubaneswar**
(Under the Deptt.of Atomic Energy, Govt.of India)

**ANNUAL ACCOUNTS** 2018 - 19

**Schedule -11 : Current Assets, Loans, Advances etc.**
( Schedule forming part of Balance Sheet as at 31.03.2019)

| Particulars | Current Year(2018-19) | | Previous Year(2017-18) | |
|---|---|---|---|---|
| b) Other Entities engaged in activities similar to that | | - | | - |
| c) Others | | | | |
| NBHM Support DHA | 1,67,174 | | 1,67,174 | |
| Deans Allowance Receivable | 2,41,200 | | 1,72,200 | |
| **Advances to Suppliers :** | | | | |
| Exim Logistics Pvt Ltd | 19,00,000 | | 25,00,000 | |
| DSS Imagetech Pvt Ltd | - | | 23,04,540 | |
| Pravartaka Infotech LLP, Bangalore | - | | 27,000 | |
| M/s A One Hospitality & cattering | 38,258 | | 72,228 | |
| Scholarship -ICMR | - | | 50,345 | |
| Scholarship -UGC | 28,22,247 | | 64,60,307 | |
| Scholarship-INSPIRE | (3,46,191) | | (15,74,493) | |
| Scholarship- DBT | (26,210) | | 1,00,000 | |
| DCS & EM,Mumbai | 19,00,03,993 | | 5,30,00,00,000 | |
| Scholarship -CSIR | 1,31,57,029 | | 1,56,83,356 | |
| IGCAR | - | | 30,402 | |
| Inspire Scholarship (MSC) | 21,45,288 | | 7,10,288 | |
| DCS & M,VECC,Kolkata | 6,87,029 | | 24,62,10,423 | |
| | | 21,07,89,817 | | |
| 2. Advances and other amounts recoverable in cash or in kind or for value to be received: | | | | 5,57,29,13,770 |
| a) on Capital Account | | 63,22,910 | | 63,17,910 |
| b) Prepayments | | - | | |
| c) Others | | | | - |
| DCSEM-Medical Expenses Receivable | 12,17,090 | | 12,17,090 | |
| R&D Receivable | 19,873 | | 8,990 | |
| | | 12,36,963 | | 12,26,080 |
| 3. Income Accrued: | | | | |
| a) On Investments from Earmarked/Endowment Fund | - | | - | |
| b) On Investment-Others | - | | - | |
| c) On Loans and Advances | - | | - | |
| d) Others | - | - | - | |
| 4. Claims Receivables | | - | | |
| | | | | - |
| Total (B) | | 22,05,43,429 | | 5,58,24,35,668 |
| TOTAL Rs.(A+B) | | 1,03,80,09,764 | | 6,82,89,32,895 |

For P. K. NAYAK & CO.
Chartered Accountants
FRN - 318155E

(CA. S.K.Sahoo)
Partner
M. No. 060588

P.K.NAYAK & CO. BHUBANESWAR CHARTERED ACCOUNTANTS

Officer on Special Duty
Finance

Finance Officer

Director

**National Institute of Science Education and Research, Bhubaneswar**
**(Under the Deptt.of Atomic Energy, Govt.of India)**

## ANNUAL ACCOUNTS 2018 - 19

**Schedule -12 : Income from Sales/Services**
( Schedule forming part of Income & Expenditure for the year ended on 31.03.2019)

Amount in Rs.

| Particulars | Current Year(2018-19) | Previous Year(2017-18) |
|---|---|---|
| 1) Income from sales | | |
| a) Sale of Finished Goods | - | - |
| b) Sale of Raw Material | - | - |
| c) Sale of Scraps | - | - |
| 2) Income from Services | - | - |
| a) Labour and Processing Charges | - | - |
| b) Professional/Consultancy Service | - | - |
| c) Agency Commission and Brokerage | - | - |
| d) Maintenance Services (Equipment/Property) | - | - |
| e) Others (Specify) | - | - |
| TOTAL Rs. | - | - |

**Schedule -13 : Grants/Subsidies**
( Schedule forming part of Income & Expenditure for the year ended on 31.03.2019)

Amount in Rs.

| Particulars | Current Year(2018-19) | Previous Year(2017-18) |
|---|---|---|
| (Irrevocable Grants & Subsidies Received) | | |
| 1) Central Government | | |
| I ) Non plan (Revenue) | 88,00,00,000 | 93,64,00,000 |
| ii) Plan (Revenue) | - | 5,51,91,348 |
| 2) State Government(s) | - | - |
| 3) Government Agencies | - | - |
| 4) Institutions/Welfare Bodies | - | - |
| 5) International Organisations | - | - |
| 6) Others (Specify) | - | - |
| TOTAL Rs. | 88,00,00,000 | 99,15,91,348 |

For P. K. NAYAK & CO.
Chartered Accountants
FRN - 318155E

(CA. S.K.Sahoo)
Partner
M. No. 060588

Officer on Special Duty
Finance

Finance Officer

Director

National Institute of Science Education and Research, Bhubaneswar
(Under the Deptt.of Atomic Energy, Govt.of India)

ANNUAL ACCOUNTS 2018 - 19

Schedule -14 : Fees/Subscriptions
( Schedule forming part of Income & Expenditure for the year ended on 31.03.2019)

Amount in Rs.

| Particulars | Current Year(2018-19) | Previous Year(2017-18) |
|---|---|---|
| 1. Registration Fees (Msc & Phd) | 1,38,15,716 | 1,24,58,238 |
| 2. License Fees | 15,29,977 | 11,20,771 |
| 3. Sale of Tender Paper | 2,84,120 | 3,04,350 |
| 4. RTI Application Fees | 336 | 490 |
| 5.Transcript Fees | 31,300 | 26,500 |
| 6.Identity card/Health Card fee | 3,125 | 3,000 |
| 7.Summer course fees | 1,44,500 | 64,500 |
| 8. Guest House Rent | 12,86,260 | 6,21,910 |
| 9. Job Application Fees | 1,26,500 | 63,000 |
| 10. Other Income | - | 2,59,126 |
| 11. Lease Rent | 5,09,452 | - |
| 12. Water Charges | 86,116 | 1,45,376 |
| TOTAL Rs. | 1,78,17,402 | 1,50,67,261 |

Schedule -15 : Income from Investments
( Schedule forming part of Income & Expenditure for the year ended on 31.03.2019)

Amount in Rs.

| Particulars | Investment from Earmark Fund | | Investment Others | |
|---|---|---|---|---|
| | Current Year(2018-19) | Previous Year(2017-18) | Current Year(2018-19) | Previous Year(2017-18) |
| (Income on Invest. From Earmarked/Endowment Funds transferred to Funds | | | | |
| 1. Interest | | | | |
| a) On Govt. Securities | - | - | - | - |
| b) Other Bonds/Debentures | - | - | - | - |
| 2. Dividends: | - | - | - | - |
| a) On Shares | - | - | - | - |
| b) On Mutual Fund Securities | - | - | - | - |
| 3) Rents | - | - | - | - |
| 4) Others (Specify) | - | - | - | - |
| TOTAL | - | - | - | - |
| Transferred to Earmarked/Endowment Funds | - | - | - | - |

For P. K. NAYAK & CO.
Chartered Accountants
FRN - 318155E

(CA. S.K.Sahoo)
Partner
M. No. 304980

Officer on Special Duty
Finance

Finance Officer

Director

'ational Institute of Science Education and Research, Bhubaneswar(I
Atomic Energy, Govt.of India)

## ANNUAL ACCOUNTS 2018-19

**Schedule -16 : Income from Royalty, Publication etc.**
( Schedule forming part of Income & Expenditure for the year ended on 31.03.2019)

Amount in Rs.

| Particulars | Current Year(2018-19) | Previous Year(2017-18) |
|---|---|---|
| 1) Income from Royalty | - | - |
| 2) Income from Publications | - | - |
| 3) Others (specify) | - | - |
| TOTAL | - | - |

**Schedule -17 : Interest Earned**
( Schedule forming part of Income & Expenditure for the year ended on 31.03.2019)

Amount in Rs.

| Particulars | Current Year(2018-19) | Previous Year(2017-18) |
|---|---|---|
| **1) On Term Deposits:** | | |
| a) With Scheduled Banks | - | - |
| b) With Non-Scheduled Banks | - | - |
| c) With Institutions | - | - |
| d) Others | - | - |
| **2) On Savings Accounts:** | - | - |
| a) With Scheduled Banks | 2,89,92,280 | 2,25,38,958 |
| b) With Non-Scheduled Banks | - | - |
| c) With Institutions | - | - |
| d) Others | - | - |
| **3) On Loans:** | | |
| a) Employees/ Staff | - | - |
| b) Others | - | - |
| **4) Interest on Debtors and Other Receivables** | - | - |
| **TOTAL Rs.** | **2,89,92,280** | **2,25,38,958** |

For **P. K. NAYAK & CO.**
Chartered Accountants
FRN - 318155E

Officer on Special Duty
Finance

Finance Officer

Director

(CA. S.K.Sahoo)
Partner
M. No. 304980

**National Institute of Science Education and Research, Bhubaneswar**
**(Under the Deptt.of Atomic Energy, Govt.of India)**

## ANNUAL ACCOUNTS 2018 - 19

**Schedule -18 : Other Income**
( Schedule forming part of Income & Expenditure for the year ended on 31.03.2019)

Amount in Rs.

| Particulars | Current Year(2018-19) | Previous Year(2017-18) |
|---|---|---|
| 1. Profit on Sale/disposal of Assets: | | |
| a) Owned Assets | - | - |
| b) Assets acquired out of grants, or received free of cost | - | - |
| 2. Export Incentives realised | - | - |
| 3. Fees for Miscellaneous Services | - | - |
| 4. Miscellaneous Income | - | - |
| TOTAL | - | - |

**Schedule -19 : Increase/(Decrease) in Stock of Finished Goods & Work-in-progress**
( Schedule forming part of Income & Expenditure for the year ended on 31.03.2019)

Amount in Rs.

| Particulars | Current Year(2018-19) | Previous Year(2017-18) |
|---|---|---|
| a) Closing Stock | - | - |
| Add: Finished Goods | - | - |
| Add: Work in Progress | - | - |
| b) Less: Opening Stock | - | - |
| Add: Finished Goods | - | - |
| Add: Work in Progress | - | - |
| NET INCREASE/(DECREASE) (a-b) | - | - |

**Schedule -20 : Establishment Expenses**
( Schedule forming part of Income & Expenditure for the year ended on 31.03.2019)

Amount in Rs.

| Particulars | Current Year(2018-19) | Previous Year(2017-18) |
|---|---|---|
| a) Pay and Allowances | 24,92,75,826 | 24,61,46,972 |
| b) Manpower (Outsourced) | 9,75,26,515 | 8,44,36,409 |
| c) Stipend to Trainee | 7,81,937 | 5,25,917 |
| d) Contribution to NPS | 2,21,72,824 | 2,21,04,479 |
| e) Leave Travel Concession | 29,22,892 | 35,07,262 |
| f) Fellowship to Phd Scholars | 6,82,04,304 | 5,80,45,080 |
| g) Fellowship to Post Doctoral Scholars | 1,05,33,042 | 71,26,889 |
| h) Contigency to PHD Students | 59,26,511 | 55,88,065 |
| i) Honorarium & Scholarship | 51,12,499 | 45,32,538 |
| j) PRIS | 3,63,22,823 | 3,33,21,056 |
| k) Medical Expenses | 60.57.734 | 17,47,908 |
| l)Children Education Allowance | 28,12,036 | 20,52,229 |
| m) Leave Encashment | 11,20,155 | 15,97,335 |
| n) Leave Salary Contribution | 2,18,199 | 5,28,191 |
| o) Professional Update Allowance | 48,29,792 | 49,19,064 |
| p ) Pension Contribution | 28,548 | 7,90,561 |
| q)Contingency Expenses PDF | 5,53,135 | 4,77,189 |
| r) Msc Scholarship (DISHA) | 94,56,775 | 61,88,734 |
| s) Summer course fellowship -student | - | 20,322 |
| t)Dress Allowance | 2,90,800 | - |
| u)Nursing Allowance | 43,200.00 | - |
| | 52,41,89,547 | 48,36,56,200 |

For **P. K. NAYAK & CO.**
Chartered Accountants
FRN - 318155E

(CA.S.K.Sahoo)
Partner
M. No. 304980

Officer on Special Duty
Finance

Finance Officer

Director

**National Institute of Science Education and Research, Bhubaneswar**
(Under the Deptt.of Atomic Energy, Govt.of India)

## ANNUAL ACCOUNTS 2018 - 19

**Schedule -21 : Other Administrative Expenses**
( Schedule forming part of Income & Expenditure for the year ended on 31.03.2019)

Amount in Rs.

| Particulars | Current Year(2018-19) | Previous Year(2017-18) |
|---|---|---|
| Graduation Ceremony Expenses | - | 4,74,704 |
| Freight & Forwarding Expenses | 39,330 | 1,46,358 |
| IISER/NISER Meet Expenses | 28,71,602 | - |
| Foundation Day Expenses | 54,000 | 1,000 |
| Purchases (Consumables) | 5,92,06,663 | 6,49,86,723 |
| Repair & Maintenance | 2,42,99,107 | 1,60,17,143 |
| Electrical Maintenance | - | 68,275 |
| Civil Maintenance | - | 12,36,055 |
| Advertisement | 14,34,472 | 12,30,786 |
| Audit Fees | 50,740 | 50,740 |
| Bank Charges & Commission | 2,79,004 | 83,660 |
| CRA Service Charges | 24,452 | 36,134 |
| Electricity Charges | 5,74,52,342 | 5,27,34,079 |
| Fuel for DG set | 13,73,456 | 2,41,417 |
| Hospitality Expenses | 9,63,879 | 24,71,816 |
| Housekeeping Expenses | 20,34,349 | 12,19,791 |
| Legal Fees | 1,23,160 | 2,17,505 |
| Meeting Expenses | 40,00,415 | 27,78,700 |
| News Papers and Periodicals | 1,04,533 | 71,842 |
| Other Academic Expenses | - | 4,200 |
| Postage & Courier | 2,50,835 | 4,78,311 |
| Printing & Stationery | 9,96,830 | 7,97,599 |
| Rent, Rates & Taxes | 1,54,965 | 5,25,587 |
| Seminar/Workshop Expenses | 25,36,167 | 41,52,573 |
| Telephone & Internet charges | 24,34,577 | 1,95,66,615 |
| Travelling & Conveyance - Domestic | 71,79,546 | 88,89,876 |
| Travelling & Conveyance - Foreign | 79,78,580 | 89,92,057 |
| Vehicle Maintenance Expenses | 78,47,773 | 90,77,399 |
| Water Charges | - | 30,49,686 |
| Professional Charges | 1,38,291 | 8,260 |
| Publication Charges | 8,66,019 | 1,54,916 |
| Horticulture and plantation Expenses | 4,37,972 | - |
| Subscription Expenses | 1,40,11,598 | 65,29,514 |
| **NISER XII PLAN** | | |
| *Domestic Travel* | 5,76,345 | 7,61,982 |
| Fellowships | 12,22,126 | 17,88,666 |
| Foreign Travels | 15,06,661 | 37,78,580 |
| Salary Expenses | 16,74,232 | 81,599 |
| Other Expense | 69,12,504 | 24,56,095 |
| Supplies & Materials | 4,03,21,718 | 4,63,24,427 |
| **TOTAL Rs.** | **25,13,58,244** | **26,14,84,671** |

For **P. K. NAYAK & CO.**
Chartered Accountants
FRN - 318155E

(CA. S.K.Sahoo)
Partner
M. No. 060588

Officer on Special Duty
Finance

Finance Officer

Director

P.K. NAYAK & CO. BHUBANESWAR CHARTERED ACCOUNTANTS

**National Institute of Science Education and Research, Bhuban**

**(Under the Deptt.of Atomic Energy, Govt.of India)**

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**Schedule -22 : Expenditure on Grants, Subsidies etc.**

( Schedule forming part of Income & Expenditure for the year ended on 31.03.2019)

Amount in Rs.

| Particulars | Current Year (2018-19) | Previous Year (2017-18) |
|---|---|---|
| a) Grant given to Institutions/Organisation | - | - |
| b) Subsidies given to Institutions/Organisation | - | - |
| TOTAL | - | - |

**Schedule -23 : Interest**

( Schedule forming part of Income & Expenditure for the year ended on 31.03.2019)

Amount in Rs.

| Particulars | Current Year (2018-19) | Previous Year (2017-18) |
|---|---|---|
| a) On Fixed Loans | - | - |
| b) On Other Loans (including Bank Charges) | - | - |
| c) Others (specify) | - | - |
| TOTAL | - | - |

For **P. K. NAYAK & CO.**
Chartered Accountants
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(CA. S.K.Sahoo)
Partner
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**National Institute of Science Education and Research, Bhubaneswar**
**(Under the Department of Atomic Energy, Govt. of India)**

**ANNUAL ACCOUNTS 2018 - 19**

## SCHEDULE 24 – SIGNIFICANT ACCOUNTING POLICIES

*(Schedule forming part of the accounts for the period ended on 31.03.2019)*

**About the organisation :**

The National Institute of Science Education and Research (NISER) set up at Bhubaneswar by the Department of Atomic Energy was registered as a Society with the Registrar of Societies, Cuttack, Orissa vide registration no:22426/16 dt. 10.07.2007 with a capital outlay of Rs 857.27 crores .

NISER conducts the following programmes in science education for bright and meritorious students who are selected through National Entrance Screening Test (NEST) conducted on all India basis.

a) An integrated 5 year M.SC programme in the core and emerging branches of basic sciences to students after 10+2 higher secondary schooling.
b) Integrated M.SC +PHD programmes after 10+2 from other universities.
c) PHD programme after MSC from other Universities.
d) Computer Science and Earth& Planetary Science

Presently NISER has 569 students admitted in 5 year M.SC programme in the various streams of Basic Sciences.

### 1. Basis of Preparation of Financial Statements

The Financial Statements have been prepared on accrual basis following going concern concept, accounting standards and in accordance with the General Accepted Accounting Principles In India (Indian GAAP) except otherwise stated elsewhere.

The accounting policies adopted in the preparation of financial statements are consistent with those of previous year.

### 2. Fixed Assets

Fixed assets are stated at cost of acquisition inclusive of inward freight, duties & taxes and incidental & direct expenses related to acquisition.

P.K.NAYAK & CO. BHUBANESWAR CHARTERED ACCOUNTANTS

**National Institute of Science Education and Research, Bhubaneswar**
**(Under the Department of Atomic Energy, Govt. of India)**

**ANNUAL ACCOUNTS 2018 - 19**

**3. Depreciation**

Depreciation has been provided on written down value method as per rate prescribed in the income Tax Act, 1961.

**4. Capital Assets(WIP)**

The institute is at project stage. Hence Capital Expenditure incurred on construction activities Auditorium Complex and XII Plan Asset like Books, Computers, Furniture & Fixtures, Machinery & Equipments etc are being shown as capital work in progress in the FY 2018-19.

**5. Recognition of income & Expenditure**

Income & expenditure are generally recognised on accrual basis & provision made for all known liabilities.

Lab consumables and stores consumables purchased during 2018-19 is treated as recurring expenditure and the consumables are transferred to respective schools of study. Necessary records are maintained at the school concerned.

**6. Foreign Exchange Transactions**

Transactions involving foreign currency are accounted at the exchange rate prevailing on the date of the transaction.

**7. Accounting for Registration Fees**

Registration fee of students are being accounted for on receipt basis.

**8. Accounting of interest earned on FD**

Interest earned against lien of FD are being accounted for on accrual basis.

**9. Government Grants/ Subsidies**

a) Government Grants of the nature of contribution towards capital cost of setting up projects are treated as grant in aid for creation of assets.

b) Grants in respect of specific fixed assets acquired are shown as a deduction from the cost of the related assets as the project is under progress.

c) Government grants/ subsidy is accounted on realisation basis.

**10. Lease**

Lease rentals are expensed with reference to lease terms.

**National Institute of Science Education and Research, Bhubaneswar**
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**ANNUAL ACCOUNTS 2018 - 19**

**11. Retirement Benefits**

Liability towards gratuity payable on death/ retirement and provision for accumulated leave encashment benefit to employees is not applicable at present.

**12. TAXATION**

Since the Institute is a research oriented organization wholly funded by Government of India, Department of Atomic Energy there being no taxable income under Income-tax Act 1961, no provision for Income tax has been made during the year.

For **P. K. NAYAK & CO.**
Chartered Accountants
FRN - 318155E

Sucanta Kumar Sahoo

**(CA. S.K.SAHOO)**
Partner
M. No. 060588

Officer on Special Duty
Finance

Finance Officer

Director

**National Institute of Science Education and Research, Bhubaneswar**
**(Under the Department of Atomic Energy, Govt. of India)**

**ANNUAL ACCOUNTS 2018- 19**

**Schedule -25: Contingent liabilities & Notes on Accounts**
(Schedule forming part of the accounts for the period ended on 31.03.2019)

Amounts in Rs.(In Crores)

**A) CONTINTENT LIABILITIES**

| | | |
|---|---|---|
| 1. | Claims against the entity not acknowledge as debts | NIL |
| 2. | Liability for partly –paid investments | NA |
| 3. | Liabilities on account of outstanding forward exchange contracts | NA |
| 4. | Guarantee & letters of credit outstanding | NIL |
| 5. | Bills Discounted | NIL |
| 6. | Other items for which the entity is contingently liable | NIL |

**B) Notes on accounts**

1. **Prior period expenditure**

   a) Rs.1,02,540/-paid / adjusted to Students caution money , mess dues against payment of their mess bill. and reversal of forfeited EMD.

2. **DCSE&M, Kolkata Advance**

   During the year out of advance of Rs24,62,10,423/- DCSEM, Kolkata has submitted account statement in respect of expenditure incurred on niser project amounting to Rs.24,55,23,394/- which is being allocated to building. Surplus amount of Rs.6,87,029/- which has since been refunded by DCSEM, Kolkata vide DD No-0752896, dt 25.06.2019 and the same has been credited in NISER account.

3. **DCSE&M, Mumbai Advance**

   During the year DCSEM Mumbai has submitted statement of accounts Rs.510,99,96,007/- in respect of advance granted to them for Niser Work against advance of Rs.530.00 lakhs. DCSEM, Mumbai has already spent Rs.510,99,96,007.00 which is being adjusted against aforesaid advance amount. Balance amount of Advance of Rs.19,00,03,993/- will be adjusted after submission of final bill by L&T Ltd to DCSEM, Mumbai.

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4. **Lien against FD**

   Lien against FD shown in Receipt & payment s account relates to items under import & the same is in order.

5. Corresponding figures for the previous year have been regrouped/ arranged, where ever necessary.

6. Schedules 1 to 25 are annexed to and form an integral part of the Balance Sheet as at 31st March, 2019 and the Income & Expenditure Account for the year ended on that date.

For **P. K. NAYAK & CO.**
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P.K. NAYAK & CO. BHUBANESWAR CHARTERED ACCOUNTANTS

150
YEARS OF
CELEBRATING
THE MAHATMA

राष्ट्रीय विज्ञान शिक्षा एवं अनुसंधान संस्थान

NISER

विद्ययाऽमृतमश्नुते


**NATIONAL INSTITUTE OF SCIENCE EDUCATION AND RESEARCH BHUBANESWAR**

**AN AUTONOMOUS INSTITUTE UNDER DEPARTMENT OF ATOMIC ENERGY, GOVERNMENT OF INDIA**

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