



...towards excellence in science

भारतीय विज्ञान शिक्षा एवं अनुसंधान संस्थान कोलकाता
INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH KOLKATA

An Autonomous Institute
under
Ministry of Human Resource Development
Govt. of India

IISER s

IISER KOLKATA

IISER PUNE

IISER MOHALI

IISER BHOPAL

IISER TVM

NIRF Ranking

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Director's Message

Indian Institute of Science Education and Research Kolkata (IISER-K) was established in 2006 as an autonomous institute for higher education by the Ministry of Human Resource Development (MHRD), Government of India, to promote high quality education and research in basic science. IISER-K has completed more than ten years of its existence and has established excellence in science in form of teaching, publications, both in terms of quality and quantity. Many under graduate students are also engaged in research as a part of their curriculum.

IISER-K today has a vibrant campus with strong faculty members of repute and supportive non-teaching staff members. The students pursuing various degrees are among the best in the country and have established a commendable culture.

Efforts of IISER Kolkata towards excellence in science have also been geared to provide international exposure to the students through participation and presentations in the national and international conferences and summer internships in the various parts of the globe. The Institute has established mutual partnership with various national and international Universities/Institutes for exchange of students and faculty and research collaborations.

Creating research infrastructure is one of our top priorities. The Institute has state-of-the-art research laboratories equipped with sophisticated modern equipment. Notably, the faculty members are attracting significant support for their research activities from both national and international funding agencies.

Several eminent scientists/scholars from India and abroad spanning different fields regularly visit IISER Kolkata to deliver special lectures on topics of wide interest to keep the students and the faculty updated with recent scientific developments.

Sports and co-curricular activities are also strongly encouraged at IISER Kolkata and students are given every form of support to develop their talents in all fields. We have a very good support system with officers and administrative staff members, which have been relentlessly helping the Institute in its pursuits of excellence in science.

Prof. Sourav Pal

Director, IISER Kolkata

Academic Department

Biological Sciences

The Department of Biological Sciences has been conducting research and teaching in a broad spectrum of areas in Biology. We work on animal behaviour, bio-diversity, cell and molecular biology, conservation biology, developmental biology, ecology, evolution, genetics, immunology, marine biology, microbiology, neuro-biology, plant biology, physiology, population biology, structural biology and biophysics. In our research, we not only encourage interdisciplinary scientific explorations, we also aim to apply our research in addressing health and environmental issues.

Chemical Sciences

The Indian Institute of Science Education and Research-Kolkata was founded in 2006 by the Ministry of Human Resource Development (MHRD), Government of India and one of the first departments to be established was the Department of Chemical Sciences (DCS). From the beginning, the Department has incarnated the Institute's mission of excellence in both research and teaching. The DCS has appreciable strength in the core areas of physical, organic and inorganic chemistry as well as in interdisciplinary research areas at the boundaries with physics, biology, earth science and materials science. An extremely wide range of state-of-the-art instrumentations are available in different research groups to carry out the DCS research activity.

Earth Sciences

Indian Institute of Science Education & Research, Kolkata is the first among five IISERs, to have established a Department of Earth Sciences. The department started its journey in 2007, a year after IISER-Kolkata was established. The Department of Earth Sciences is committed to building a community of researchers including students and faculty members. The goal of the Department is to develop a modern center for Earth Science Education and Research in three core areas: Environmental and ecological studies in modern and ancient systems, Isotope Geochemistry and Biogeochemical studies, Solid Earth studies.

Mathematics and Statistics

As an integral part of the fresh, dynamic and promising new concept called IISER Kolkata, the department is committed to its central theme of integrating education with research so that undergraduate teaching as well as doctoral and postdoctoral research work could be carried out in symbiosis.

Physical Sciences

Department of Physical Sciences focuses on the cutting edge research in the fields of condensed matter, astrophysics and cosmology, nano-science, optics, quantum information, non-linear, and high energy physics. In synchrony with the institute's motto, the department also aims at teaching and training students from basic to advanced level.

Center of Excellence in Space Sciences, India (CESSI)

The Center of Excellence in Space Sciences India (CESSI) is a multi-institutional Center of Excellence hosted by the Indian Institute of Science Education and Research (IISER) Kolkata and has been established through funding from the Ministry of Human Resource Development. CESSI aims to explore the Sun's activity, generate the understanding necessary for space weather forecasting, hunt for gravitational waves, support national space science initiatives, participate in international capacity building activities and pursue public-private partnerships in space science research. The Center will take advantage of high-



performance computing facilities, cloud computing and the high-speed National Knowledge Network grid to achieve its goals.

CESSI faculty are drawn from IISER Kolkata, IISER Pune, Indian Institute of Astrophysics (Bangalore), Udaipur Solar Observatory-Physical Research Laboratory (Udaipur) and the Indian Space Research Organization (Bangalore), have wide-ranging interests in the astrophysical space sciences, and have the experience of handling international and national space science projects.

Since its inception CESSI has already contributed to major developments in astrophysics and space sciences. Notably, CESSI personnel are associated with the recently approved Aditya-L1 mission - India's first space mission to study the Sun. CESSI personnel contributed to the first direct detection of astrophysical gravitational waves from a binary Black Hole merger system and are involved with the LIGO-India mega project which aims to deploy a third gravitational wave detector in India to supplement the observations from the two detectors in the United States of America. CESSI affiliated personnel have also been involved with the planning and installation of India's most advanced ground-based solar telescope - the Multi-application solar telescope at Udaipur Solar Observatory (Physical Research Laboratory) which has been operating since 2015. CESSI faculty are also playing important roles in national and international capacity building through their roles in working groups and committees at the International Astronomical Union (IAU), Committee on Space Research (COSPAR), Scientific Committee on Solar-Terrestrial Physics (SCOSTEP), Astronomical Society of India (ASI) and the Indian Space Research Organization (ISRO).

Centre for Advanced Functional Materials (CAFM)

At Indian Institute of Science Education and Research, Kolkata, the Centre for Advanced Functional Materials (CAFM) has a special mission to foster collaborative, interdisciplinary research and education in the science and technological applications of advanced solid state and soft materials. With an emphasis on nanoscience and nanotechnology, the research areas of CAFM include hybrid solar cells; fuel cells; strongly correlated materials; polymer and supramolecular delivery vehicles; materials for environmental remediation. CAFM coordinates to foster advanced research towards synthesis of smart materials, structure-property elucidation, device fabrication and

cutting-edge applications. Apart from establishing collaboration between researchers within and outside IISER Kolkata, CAFM promotes technology transfer of developed materials and devices. The faculty members of CAFM provide research training to BS-MS, IPhD students, PhD scholars and postdoctoral fellows, and conduct interdisciplinary courses on advanced functional materials.

National Centre for High Pressure Studies (NCHPS)

The National Centre for High Pressure Studies (NCHPS) in IISER Kolkata aims to foster interdisciplinary and collaborative research in the field of Natural Sciences, Materials Sciences and Geosciences. The emphasis will be on fundamental studies of structural changes and novel phase transitions of both naturally occurring and designed materials that occur under extreme conditions, using an integration of theory and experiment. The recently created centre has facilities to achieve megabar pressures and very high temperatures using laser heated diamond anvil cell (LHDAC) and to study the changes in physical properties of materials in situ using Raman Spectroscopy and electrical transport studies.

Academic Programmes

When the brightest meets the best, the possibilities are endless. IISER Kolkata derives strength from its talented students, faculty of excellent academic repute, state-of-the-art research facilities and flexibility of academic programmes. An important aspect of IISER Kolkata is its interdisciplinary character, as modern science education and research focus on broader perspectives. Keeping this in mind, IISER Kolkata offers a 5-Year BS-MS Dual-Degree Programme, a 2-years MS in Space physics Programme for BE/BTech students, an Integrated PhD Programme (IPhD) for students joining the Institute after completing a BS/BSc degree elsewhere, and a vibrant PhD Programme. The co-existence of BS-MS, IPhD and PhD students epitomizes the synergy between research and teaching that is achieved in the Institute. Notably, all pre-doctoral students receive stipends to meet their academic expenses.



5-Year BS-MS Dual-Degree

The 5-Year BS-MS Dual-Degree Programme is the flagship programme of all IISERs. At present a student at IISER Kolkata has to take courses which involve one year of compulsory exposure to all the major science disciplines to study, available at the Institute – namely Physics, Chemistry, Mathematics, Biology and Earth Sciences, with laboratory courses which also include applications of Computer Science. In the second year, students choose three of the five courses on offer as 'pre- majors' so that they can focus more on their major subjects of interest. At the end of the second year the students choose 'major subjects' (discipline) which will be the focus of their studies for the next three years. However, in these three years they have adequate opportunity to study other disciplines by taking 'minor courses' as well as elective and interdisciplinary courses on offer.

The final year is primarily devoted to a year-long research project leading to a Masters' thesis. Some disciplines also give a small number of courses in the final year in order to achieve the desired educational objectives. In the course of the five years they spend in the Institute, all our students undertake summer research either in-house or elsewhere. Understandably, our graduates are well- exposed to undertake research in frontier areas. The current strength of BS-MS students is 875 and a total number of 490 students received their BS-MS degree.

All the five IISERs work together in many ways. There is a common course philosophy that is followed and the course structures are in tune with each other. The initial curriculum development for all IISERs was undertaken by a 'National-Level Curriculum Committee', which has now evolved, based on in-house experience and expertise of IISER Kolkata faculty.

The process of admission to the 5-Year BS-MS Dual-Degree programme is through three channels, viz., Kishore Vaigyanik Protsahan Yojana (KVPY), IIT-JEE Advanced Merit List and an Aptitude Test conducted by the IISERs, taken by the top 1% students from the State and Central Board examinations.

MS in Space Physics

MM is a programme run by the Center of Excellence in Space Sciences India (CESSI) to attract qualified and motivated engineering (BE/BTech) students to scientific research. This is a programme which supports fundamental and applied national research in space sciences. It is a unique blend of basic sciences and engineering sciences allowing integration of fundamental knowledge while developing proficiency in research.

In this programme MM students take admission in July every year. Based on the evaluation of applications following an admission call, some candidates are short-listed and called for interview. Recommendation letters may be sought for short-listed candidates. Final selection is based on the basis of performance in the interview, academic background of the candidate and any other criterion determined by the selection committee. No candidates are selected if suitable candidates of sufficient quality are not found.

Integrated-PhD

In the year 2009, the Institute initiated the Integrated Doctor of Philosophy (IPhD) Programme. The aim of this endeavour is to attract outstanding and innovative undergraduates to research in basic sciences and to motivate them to begin research at an early stage of their educational career. It is a combination programme which starts with a comprehensive Masters' (MS) Programme followed by Research (PhD) Programme. The Institute invites applications in the fields of Biological, Chemical, Physical, Earth Sciences, and Mathematics & Statistics. Individual departments select deserving candidates from the pool of applicants, based on their academic backgrounds, research interests and performance in the selection test (written test followed by interview). The selection is conducted once a year. At present there are 155 students in the IPhD programme. It is expected that exposure to the research-oriented atmosphere in their first two years of course work will help these students to carry out research more effectively.



