

# Homi Bhabha National Institute: A deemed to be University

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## **Preamble**

Right from its inception, the Department of Atomic Energy (DAE) had placed due emphasis on the sustained development of human resources for carrying out various functions related to the mission programmes of DAE. This resulted in the setting up of the BARC Training Schools at various campuses of DAE to train young scientists and engineers to take up a career in the development of nuclear energy. The setting up of Homi Bhabha National Institute (HBNI) was an extension of this idea, aimed to provide a thrust to academic programmes in DAE institutions towards enhancing the research capabilities. Set up in 2005 as a Deemed to be University, HBNI has today grown into a highly reputed research university with high-value contributions to DAE as well as to the society. This article provides a broad perspective of the growth of HBNI.

## **1. The Genesis**

The visionary decision to establish a University under the aegis of DAE was taken by Dr. Anil Kakodkar, then Secretary, DAE and Chairman, Atomic Energy Commission, DAE based on a report by a committee chaired by Prof. P. Rama Rao. In January 2004, DAE submitted a proposal to the Ministry of Human Resource Development (MHRD) to establish Homi Bhabha National Institute (HBNI) having the status of a Deemed-to-be University under section 3 of UGC Act 1956. The entire process of obtaining the UGC recognition was steered by Dr. R. B. Grover, then Director, Knowledge Management Group, BARC. The following R&D centres and grant-in-aid institutions were proposed to be the Constituent Institutions (CIs) of HBNI.

*R&D Centres:*

- Bhabha Atomic Research Centre (BARC), Mumbai
- Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam
- Raja Ramanna Centre for Advanced Technology (RRCAT), Indore
- Variable Energy Cyclotron Centre (VECC), Kolkata

*Grant-in-aid Institutions*

- Saha Institute of Nuclear Physics (SINP), Kolkata
- Institute for Plasma Research (IPR), Gandhinagar
- Institute of Physics (IoP), Bhubaneswar
- Harish-Chandra Research Institute (HRI), Allahabad
- Tata Memorial Centre (TMC), Mumbai
- Institute of Mathematical Sciences (IMSc), Chennai

An Expert Committee appointed by the UGC visited on March 28, 2005, to evaluate the HBNI academic infrastructure and based on the report of the Expert Committee, University Grants Commission advised the Government of India to declare the HBNI, Mumbai as a Deemed-to-be University along with 10 constituent institutions under the UGC Act. The recommendation was accepted by the Government of India and an announcement in this regard was made by the Prime Minister during his visit to BARC on June 4, 2005. Academic programmes under HBNI started in all the 10 CIs in 2006 under the dynamic leadership of the founding Director, Dr. R. B. Grover. HBNI was registered as a Society on November 18, 2004 and as a Trust on June 02, 2005 under relevant legal provisions applicable to such entities in the State of Maharashtra. On February 19, 2014, a notification was issued by the DAE declaring the HBNI as a 'Grant-in-Aid Institution'. National Institute of Science Education and Research (NISER), Bhubaneswar, became an Off-Campus Centre (OCC) of HBNI later on February 5, 2016.

**2. HBNI today**

HBNI has catalysed the indigenous development of nuclear technology by creating high-quality human resources in the country that could address challenging issues related to the indigenous development of nuclear technology and other high technology areas, through academic programs, viz., Integrated Master, Master and Ph.D. degrees in Chemical, Engineering, Life, Mathematical, Medical & Health and Physical Sciences while encouraging inter-disciplinary research. Additionally, academic programs in the domain of Applied Systems Analysis have also been identified to ensure the availability of adequate qualified human resources to address issues pertaining to nuclear law, the economics of nuclear power, nuclear security, nuclear proliferation, intellectual property rights and humanities and social science domain issues, etc. Presently, HBNI offers 43 academic programmes in different disciplines and some of which are very unique eg. M.Sc. (Hospital Radiopharmacy), M.Sc. (Public Health and Epidemiology), etc. HBNI has an excellent faculty pool (total=1127) comprising all those who join its CI/OCC as a faculty member in grant-in-aid institutions. However, only about 10% scientific officers having Ph.D. degree and vast research experience in R&D institutions are

recognized as HBNI faculty member after following a rigorous screening process. For recognitions of medical doctors at BARC-RMC and TMC as HBNI faculty members, procedure laid down by MCI/NMC is strictly followed.

### **2.1 Academic Programmes of the Institute**

The HBNI offers a range of academic programmes in chemical sciences, engineering sciences, medical & health sciences, life sciences, mathematical sciences and physical sciences. It also has a programme in Applied Systems Analysis. All institutions, except NISER, conduct academic programmes for which entry-level qualification is a Bachelor's degree or a higher. NISER admits Higher Secondary passed students for its five years Integrated M.Sc. programme.

Ph.D. degrees in varied disciplines are offered by HBNI under the following Board of Studies.

- Physical Sciences
- Chemical Sciences
- Mathematical Sciences
- Engineering Sciences
- Life Sciences
- Medical & Health Sciences
- Applied Systems Analysis

Doctoral students also work in the area of computational biology, medical and health sciences and theoretical computer science. HBNI also offers an integrated Ph.D. programme where students study for M.Sc./M.Sc.(Engg) followed by Ph.D. both in single and double degree options. It has also initiated an integrated MD-Ph.D. program at TMC. The Institute offers a unique Ph.D. programme where students are encouraged to work at the interface of basic research and technology development. Under this programme, they work under the guidance of two supervisors, one having strength in basic research and the other in technology development.

M.Tech. degree in Engineering Sciences is also offered. The course work is offered at all campuses of BARC Training School. Project work is offered at BARC, IGCAR, RRCAT, VECC, IPR and other units of DAE. Those who are not able to pursue or not interested in pursuing a project/research work have the option to get a post-graduate diploma in lieu of M.Tech. degree. M.Sc. (Engg) programme of two-and-a-half-year duration offered by HBNI has more emphasis on research as compared to M.Tech. The duration of the project work under this programme is one and a half year, while the duration of the course work is up to one year.

M.Sc. (Physics) is offered at HRI. Five years of Integrated M.Sc. in Chemical Sciences, Life Sciences, Mathematical Sciences and Physical Sciences are offered at NISER.

HBNI offers Post Graduate Courses in Medical & Health Sciences at TMC as well as at the Radiation Medicine Centre (RMC) of BARC with various specializations eg. MD (Pathology, Anesthesia, Radio-diagnosis, Radiation Oncology, Microbiology, Nuclear Medicine, Palliative Medicine, Immuno-Hematology and Blood Transfusion at TMC; MD (Nuclear Medicine) at RMC. Super Specialty Courses offered in Medical & Health Sciences at TMC include Doctor of Medicine (DM) in Medical Oncology, Pediatric Oncology, Gastroenterology, Critical Care, Oncopathology and Interventional Radiology and Master of Chirurgiae (MCh) in Surgical Oncology and Gynecological Oncology, Head & Neck Surgery and Plastic and Reconstructive Surgery. HBNI also runs Certified Fellowship Programmes of two years duration in Medical &

Health Sciences at TMC. These value-added courses are offered with specialization in Orthopedic Oncology, Breast Oncology, Thoracic Oncology, Uro Oncology, Interventional Radiology, Surgical Pathology, Haematopathology, Dental & Prosthetic Surgery, Onco-Anaesthesia and Pain, Cancer Imaging, Radiation Oncology (IMRT, IGRT), Haemato-Oncology, Preventive Oncology, Infectious Diseases & HIV Medicine, Gastroenterology and HPB Oncology, Pulmonary Oncology, Molecular Haemato-Oncology, Oral Oncology with Reconstructive Surgery, Plastic and Reconstructive Oncology, Solid Tumor Oncology and Pediatric Oncology.

## ***2.2 Skill Development***

In addition to the academic programs mentioned above, HBNI also runs several medical academic programmes that are aimed at skill development. These include M.Sc. (Hospital Radiopharmacy) and M.Sc. (Nuclear Medicine and Molecular Imaging Technology) at RMC; whereas M.Sc. (Nursing), M.Sc. (Clinical research) and M.Sc. (Nuclear Medicine and Molecular Imaging Technology), M.Sc. (Public Health and Epidemiology) and M.Sc. (Occupational Therapy in Oncology) at TMC. A Diploma program in Radiological Physics has proved to be an excellent source of trained personnel who take up a career in radiation safety at various hospitals and other institutions handling radioactivity or radiation sources.

## ***2.3 BARC Training School***

The BARC Training School constitutes an important source of manpower for the DAE's programmes. Set up in 1957 by Dr. Homi Bhabha, the BARC Training School (originally called AEET Training School) has trained scientists and engineers to take up challenging mission programmes of DAE. From the first (1957–58) to the 65<sup>th</sup> (2020–21) batch, approximately 2000 trainees in science and 5000 trainees in engineering have graduated from the BARC Training School; in fact, almost all the leaders of the atomic energy programme during the past two decades have been products of the Training School.

After the setting up of HBNI, the trainees successfully graduating from the Training School are granted a Post-graduate diploma in nuclear science and engineering, with the option of pursuing an M. Tech program by carrying out a project. Over a period of time, innovations have been introduced in the curriculum of the training program, to prepare the students to take up challenging projects for the development of nuclear science and technology and at the same time, provide them with the necessary academic base to evolve into a consummate researcher.

## **3. The Academic Philosophy**

HBNI provides flexibility to the student in his learning process by providing access to all the Constituent Institutions (CIs)/Off-campus Centre (OCC) with regard to the use of their research facilities and academic guidance. Credits can be earned by students pursuing research-based degrees, by attending courses at other CI/OCC subject to approval by the Doctoral /Monitoring Committee. Research students can also have co-guides from other CIs to take advantage of the expertise and knowledge base available across the CIs. HBNI has signed MoUs with several reputed Universities/Institutes at the National and International levels for Academic collaborations. As a part of such MoUs, a doctoral student can carry out course work in another institute to meet credit requirements. There is also a provision to jointly guide a student for Ph.D. degree.

All the CIs and OCC have world-class experimental facilities and it is indeed one of the objectives of HBNI to encourage the students to collaborate across institutions and get access to

national facilities to work on problems that are at the frontiers of contemporary research. All the CIs and OCC have excellent library facilities, with a large collection of books and subscribes to a large number of research journals. These facilities help the students in shaping their academic careers.

#### 4. Academic Output and Accreditation

HBNI has been accredited by NAAC with an A+ grade in the second cycle. In the MHRD's National Institutional Ranking Framework (NIRF) exercise for the year 2021, results of which were announced in July 2022, HBNI received 11th rank under Research University and 17th rank in the University category.

The total number of journal publications with HBNI affiliation during the calendar year 2021, as indexed by Scopus is 2922. Based on high-quality publications in the Nature Group of Journals, the Nature Index 2021 placed HBNI in the second position among all institutions in India, and in the first position with regard to publications in Physical Sciences.

Figure 1 displays intake of students in different academic programmes of HBNI during 2021-22 and the progress in human resource output of HBNI is depicted in Figures 2 to 5. The total number of Ph.D. degrees awarded by HBNI till 31<sup>st</sup> March 2022 stands at 2058 and the number of doctoral students who completed their academic programme during 2021-22 is 253. HBNI has awarded 55 M.Tech., 3 M.Sc. (Engg), 12 M.Sc. (Physics), 94 Integrated M.Sc., 5 M.Sc. (Nursing), 11 M.Sc. (Clinical Research), 128 post-graduate & super specialty medical degrees with specializations in Oncology, 11 post-graduate Diploma in Nuclear Science and Engineering, 5 diploma in Medical Radio-isotope Techniques (DMRIT) and 10 post graduate diploma in Fusion Imaging Technology (PGDFIT) during 2021-22.

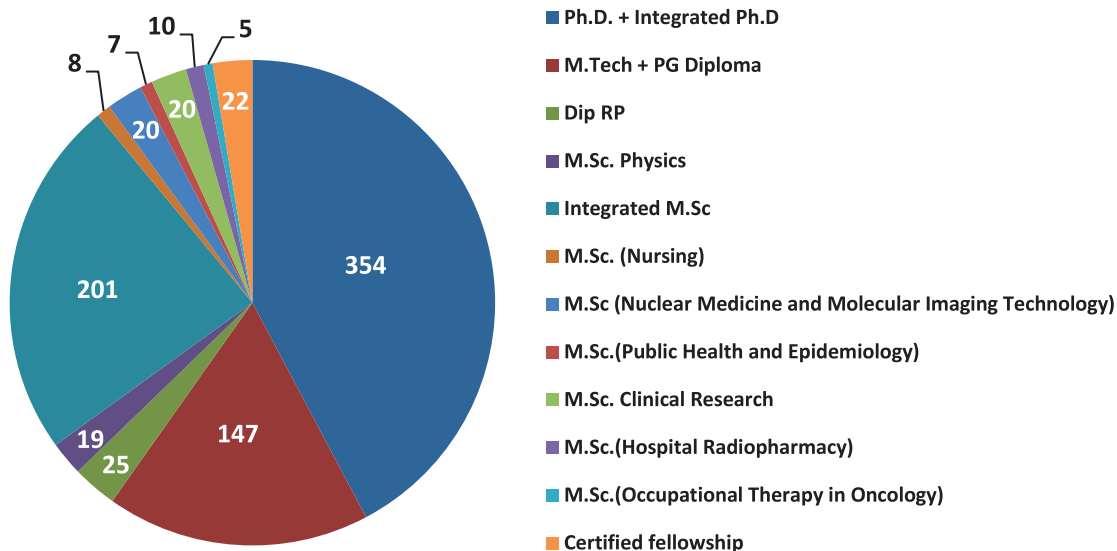
Eight hundred and thirty-eight students were admitted in different academic programmes during 2021-22, out of which 354 students were for Ph.D. programmes. At present about 1900 students are pursuing Ph.D./Int. Ph.D. in various disciplines.

#### 5. Conclusion

The setting up of HBNI was primarily aimed to strengthen DAE- relevant programme-based linkages among the R&D centres and grant-in-aid institutions through academically oriented higher education and research for enhancing the capabilities to meet the imminent and future challenges, and at the same time to make available the excellent faculty pool and strong infrastructures at DAE to outside students for research programmes.

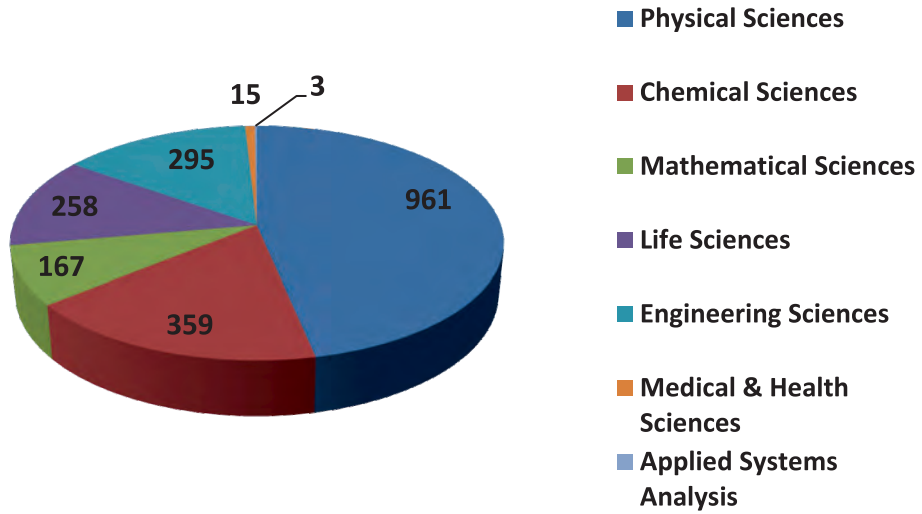
The academic governance system of HBNI has encouraged the pursuit of excellence in sciences (including engineering sciences) and mathematics in a manner that has major significance for the progress of indigenous nuclear technological capability. HBNI has provided an academic framework for integrating basic research with technology development and encouraged inter-disciplinary research. In addition to providing a strong human resource base for the R&D programs in DAE as well as other institutions in the country, HBNI also continues to generate specialists and superspecialists in cancer care, treatment and research that would go a long way in aiding India's fight against cancer. The success of the HBNI experiment augurs well for the development of high-quality S&T man power for the country and especially for the DAE.

Fig.1: Programmewise Admission Details during 2021-22

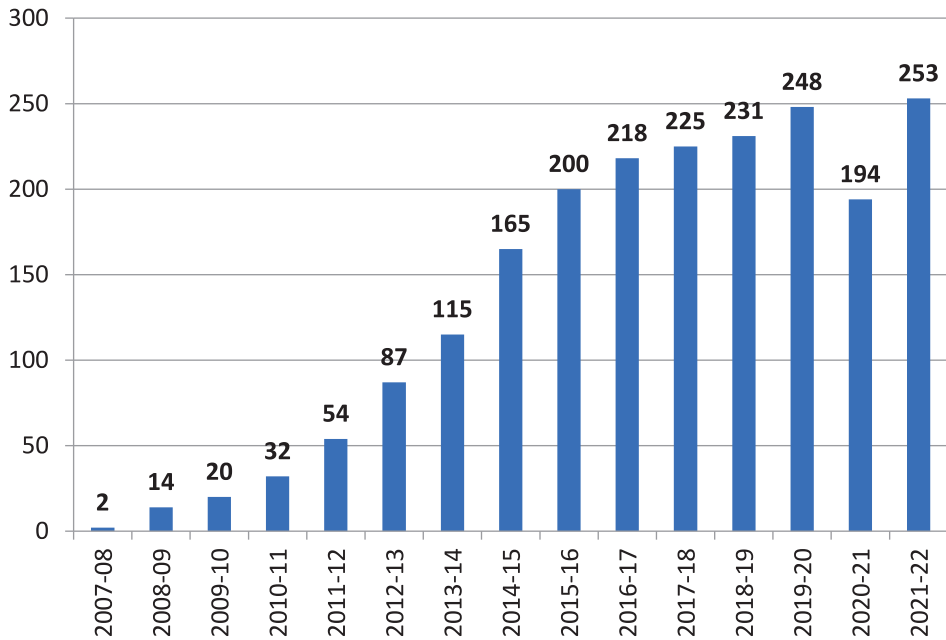


Academic Programme	BARC	IGCAR	RRCAT	VECC	SINP	IPR	TMC	IoP	IMSc	HRI	NISER	Total
Ph.D. + Integrated Ph.D	118	4	18	15	19	15	21	12	31	17	84	354
M.Tech + PG Diploma	119	20	....	....	....	8	....	....	....	....	....	147
MD	....	....	....	....	....	....	....	....	....	....	....	0
Dip RP	25	....	....	....	....	....	....	....	....	....	....	25
DM/MCh	....	....	....	....	....	....	....	....	....	....	....	0
M.Sc. Physics	....	....	....	....	....	....	....	....	....	19	....	19
Integrated M.Sc	....	....	....	....	....	....	....	....	....	....	201	201
M.Sc. (Nursing)	....	....	....	....	....	....	8	....	....	....	....	8
M.Sc (Nuclear Medicine and Molecular Imaging Technology)	10	....	....	....	....	....	10	....	....	....	....	20
M.Sc.(Public Health and Epidemiology)	....	....	....	....	....	....	7	....	....	....	....	7
M.Sc. Clinical Research	....	....	....	....	....	....	20	....	....	....	....	20
M.Sc.(Hospital Radiopharmacy)	10	....	....	....	....	....	....	....	....	....	....	10
M.Sc.(Occupational Therapy in Oncology)	....	....	....	....	....	....	5	....	....	....	....	5
Certified fellowship	....	....	....	....	....	....	22	....	....	....	....	22
<b>Total</b>	<b>282</b>	<b>24</b>	<b>18</b>	<b>15</b>	<b>19</b>	<b>23</b>	<b>93</b>	<b>12</b>	<b>31</b>	<b>36</b>	<b>285</b>	<b>838</b>

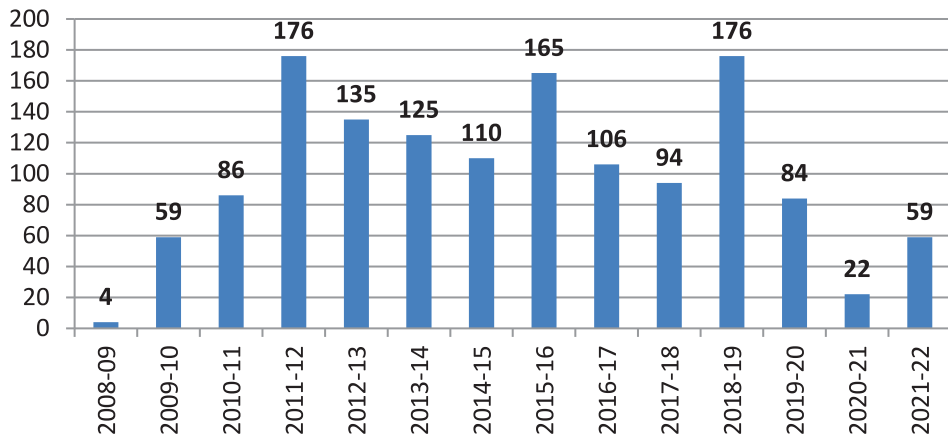




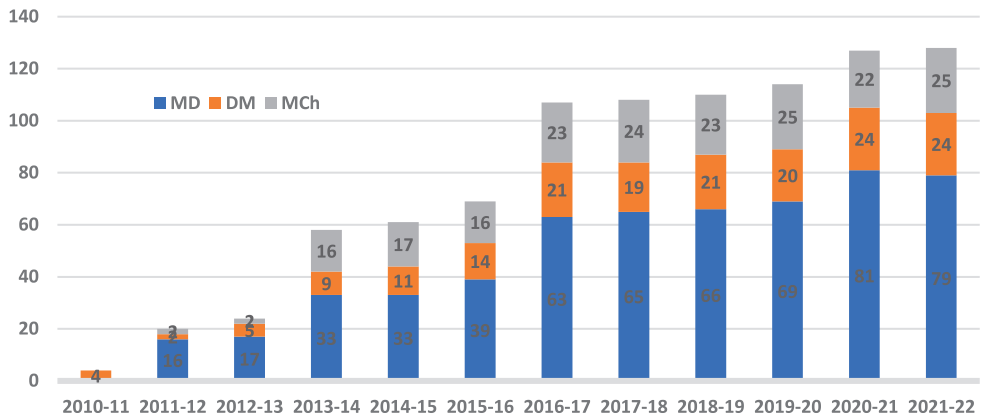
**Fig.2: Programme wise Ph.D results declared since inception (Total=2058)**



**Fig. 3: Year wise Ph.D. results declared  
Total Ph.D. Output = 2058**



**Fig. 4: Year wise M.Tech. results declared**  
Total = 1401



**Fig. 5: Year wise MD/ DM/ MCh results declared**  
Total MD=561, DM=174, MCh=194