

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 BARC Training Schools at various campuses of DAE to train young scientists and engineers for taking 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

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 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. HBNI today has following institutes under its umbrella:

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
- National Institute of Science Education and Research (NISER), Bhubaneswar
- The Institute of Mathematical Sciences (IMSc), Chennai
- Homi Bhabha Cancer Hospital & Mahamana Pandit Madan Mohan Malviya Cancer Centre (HBCH & MPMMCC) Varanasi
- Homi Bhabha Cancer Hospital and Research Centre (HBCH & RC), New Chandigarh

An Expert Committee appointed by University Grants Commission (UGC) visited HBNI on March 28, 2005, to evaluate its academic infrastructure and based on the report of the Expert Committee, UGC advised the Government of India to declare HBNI, Mumbai as a Deemed-to-be University along with 10 constituent institutions (CIs) 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 2, 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 HBNI as a 'Grant-in-Aid Institution'. National Institute of Science Education and Research (NISER), Bhubaneswar, became an Off-Campus Centre (OCC) of HBNI on February 5, 2016. Later, Homi Bhabha Cancer Hospital and Mahamana Pandit Madan Mohan Malviya Cancer Centre (HBCH & MPMMCC) at Varanasi and Homi Bhabha Cancer Hospital & Research Centre (HBCH & RC) at New Chandigarh were added as the OCCs of HBNI to further strengthen cancer education, research and treatment in India.

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 Masters, Masters 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 49 academic programmes in different disciplines, some of which are very unique eg. M.Sc. (Nuclear Medicine Technology & Hospital Radiopharmacy), M.Sc. (Public Health and Epidemiology), etc. HBNI has an excellent faculty pool comprising all those who join its CI/OCC as a faculty member in grant-in-aid institutions. However, in R&D institutions, only

experienced senior scientific officers having Ph.D. degree are recognized as HBNI faculty member after following a rigorous screening process. For recognition of medical doctors at BARC-RMC, TMC, HBCH & MPMMCC and HBCH & RC as HBNI faculty members, procedure laid down by National Medical Commission (NMC) is strictly followed.

2.1 Academic Programmes of the Institute

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 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
- Interdisciplinary Science and Engineering

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 BARC Training School, Mumbai. Project work is offered at BARC, IGCAR, RRCAT, VECC, IPR and other units of DAE. Those who are not able to pursue or are 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 upto one year.

M.Sc. (Physics) and M.Sc. (Mathematics) are offered at HRI. A Five years Integrated M.Sc. programme in Chemical Sciences, Life Sciences, Mathematical Sciences and Physical Sciences is 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. M.D. (Pathology, Anesthesia, Radio-diagnosis, Radiation Oncology, Microbiology, Nuclear Medicine, Palliative Medicine, Immuno-Hematology and Blood Transfusion at TMC; M.D. (Nuclear Medicine) at

RMC. Super Specialty Courses offered in Medical & Health Sciences at TMC include Doctor of Medicine (D.M.) in Medical Oncology, Pediatric Oncology, Gastroenterology, Critical Care, Oncopathology and Interventional Radiology and Master of Chirurgiae (M.Ch.) 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. (Nuclear Medicine Technology & 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 Masters of Occupational therapy (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 68th batch (2024-25), approximately 3066 trainees in science and 5342 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 dedicated researcher.

3. The Academic Philosophy

HBNI provides flexibility to the students in their learning process by providing access to all the CIs and OCCs 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/OCCs to take advantage of the expertise available across the CIs/OCCs. 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. program. HBNI has largely implemented academic flexibility

in line with NEP 2020. All the CIs and OCCs 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 OCCs 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 (2021). In the MHRD's National Institutional Ranking Framework (NIRF) exercise for the year 2024, results of which were announced in August 2025, HBNI received 7th rank under Research University, 12th rank in the University category and 20th rank in the Overall category.

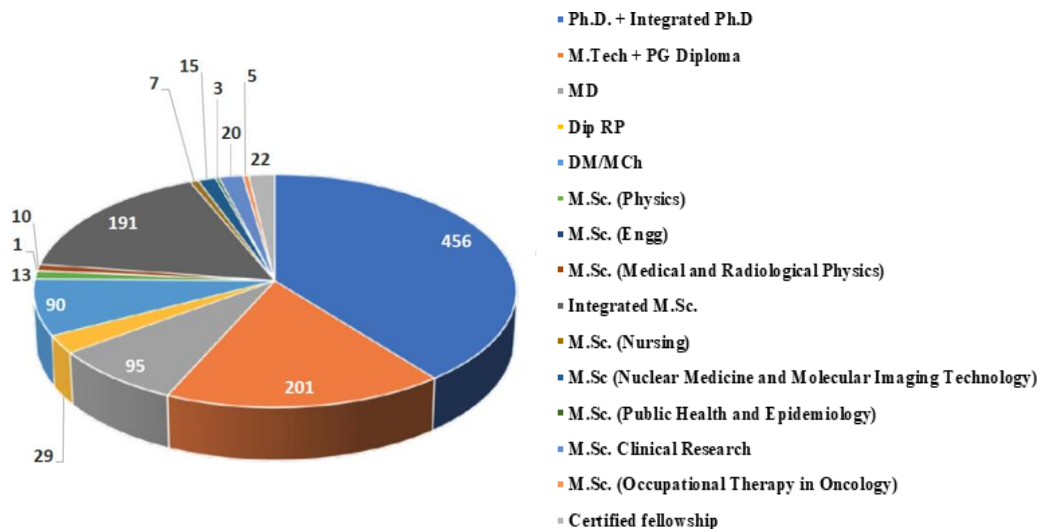
The total number of journal publications with HBNI affiliation during the calendar year 2024, as indexed by Scopus is 2711. Based on high-quality publications in the Nature Group of Journals, the Nature Index 2025 placed HBNI in the second position among all disciplines as well as in Physical Sciences amongst all institutions in India.

Figure 1 displays intake of students in different academic programmes of HBNI during 2024-25 and the progress in human resource output of HBNI is depicted in Figures 2 to 5. 1158 students were admitted in different academic programmes during 2024-25, out of which 456 students were for Ph.D. programs. At present, about 2046 students are pursuing Ph.D./ Int. Ph.D. in various disciplines. The total number of Ph.Ds. awarded by HBNI till 31st March 2025 stands at 2846 and the number of doctoral students who completed their academic programme during 2024-25 is 293. HBNI has awarded 131 M.Tech., 13 M.Sc. (Physics), 158 Integrated M.Sc., 6 M.Sc. (Nursing), 20 M.Sc. (Clinical Research), 98 post-graduate & super specialty medical degrees with specializations in Oncology, 70 Post-graduate Diploma in Nuclear Science and Engineering and 18 Post-graduate diploma in Nuclear Medicine and Molecular Imaging Technology (NMMIT) during 2024-25.

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 infrastructure 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. Programme wise admission details during 2024-2025 (Total=1158)

Academic Programme	BARC	IGCAR	RRCAT	VECC	SINP	IPR	TMC	IoP	IMSc	HRI	NISER	Total
Ph.D. + Integrated Ph.D	128	48	19	14	40	14	36	7	18	10	122	456
M.Tech + PG Diploma	201	....	....	....	....	....	....	....	....	....	....	201
MD	6	....	....	....	....	....	89	....	....	....	....	95
Dip RP	29	....	....	....	....	....	....	....	....	....	....	29
DM/MCh	....	....	....	....	....	....	90	....	....	....	....	90
M.Sc. (Physics)	....	....	....	....	....	....	....	....	....	13	....	13
M.Sc. (Engg)	1	....	....	....	....	....	....	....	....	....	....	1
M.Sc. (Medical and Radiological Physics)	....	....	....	....	....	....	....	....	....	....	10	10
Integrated M.Sc.	....	....	....	....	....	....	....	....	....	....	191	191
M.Sc. (Nursing)	....	....	....	....	....	....	7	....	....	....	....	7
M.Sc. (Nuclear Medicine and Molecular Imaging Technology)	....	....	....	....	....	....	15	....	....	....	....	15
M.Sc. (Public Health and Epidemiology)	....	....	....	....	....	....	3	....	....	....	....	3
M.Sc. Clinical Research	....	....	....	....	....	....	20	....	....	....	....	20
M.Sc. (Occupational Therapy in Oncology)	....	....	....	....	....	....	5	....	....	....	....	5
Certified fellowship	....	....	....	....	....	....	22	....	....	....	....	22
Total	365	48	19	14	40	14	287	7	18	23	323	1158

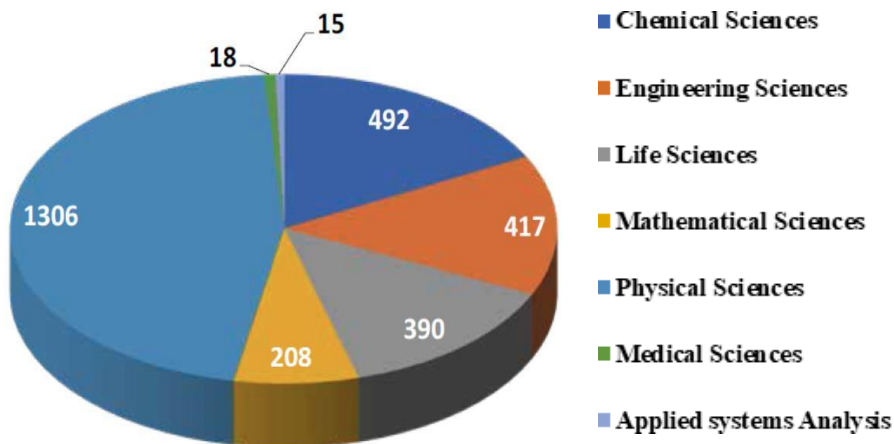


Fig. 2: Discipline wise distribution of Total (2846) Ph.D. results declared since inception

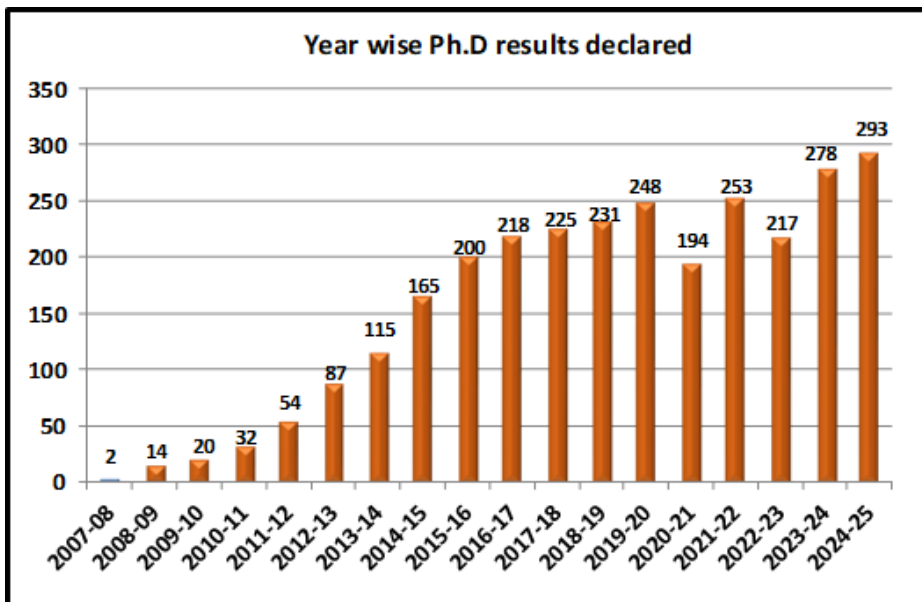


Fig. 3: Year wise Ph.D. results declared (Total=2846)

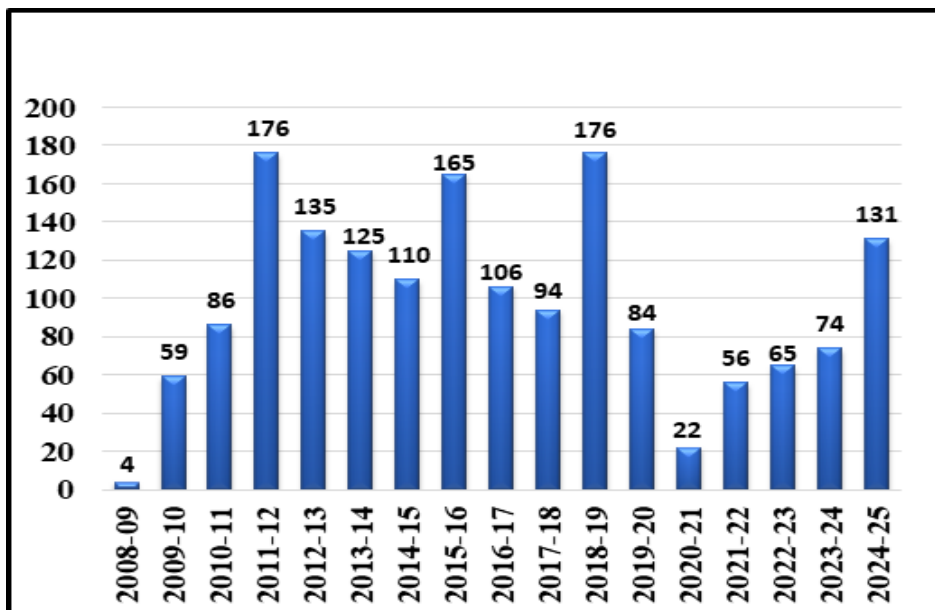


Fig. 4: Year wise M. Tech. results declared (Total=1689)

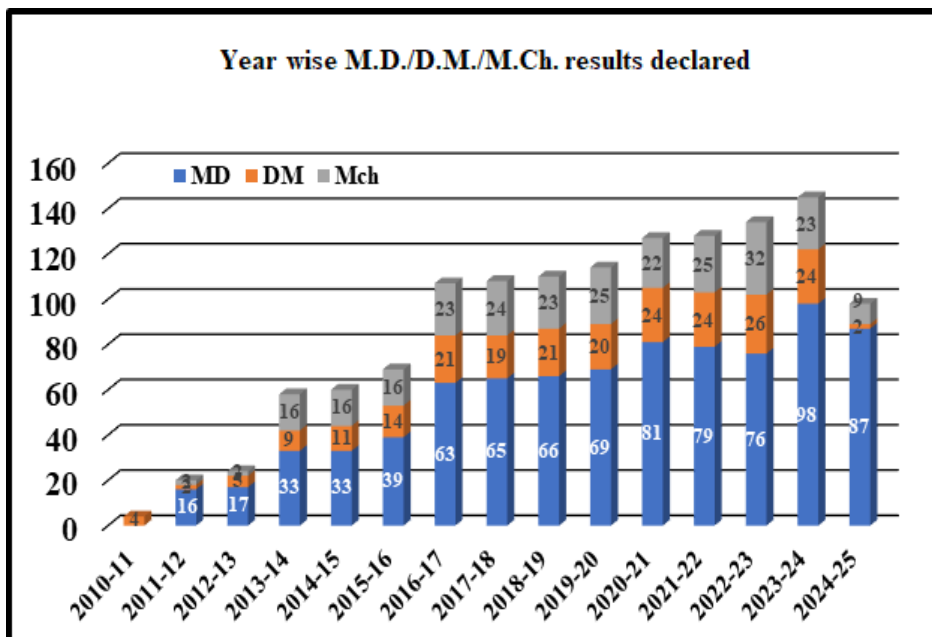


Fig. 5: Year wise M.D./ D.W/ M.Ch. results declared