

# MANIPAL CENTRE FOR NATURAL SCIENCES

[MCNS] Centre of Excellence



Manipal Academy of Higher Education (MAHE), had created the Manipal Centre for Natural Sciences (MCNS) in the year 2012, primarily to nurture fundamental research in the Natural Sciences (which includes physical sciences like physics, chemistry, etc., and earth sciences like geology, biology, etc.). In the year 2013 the MCNS was recognized as a 'Centre of Excellence' under MAHE.

Since inception MCNS is an “all-research” Centre, and it has been striving to promote fundamental research in the forefront areas of natural sciences by encouraging independent and creative thoughts essential for scientific pursuit. The Centre presently has both academic and research programs. Building on its core strength in physics, MCNS is now expanding to include, earth and planetary sciences, chemistry and computational sciences, as part of an ambitious mandate, in the coming years.

### Academics and Research

MCNS has a regular Ph.D. program, from its inception. This is open to students who have completed their M.Sc. degree with excellent academic record and propose to do research in a contemporary topic in any area of science being pursued in the Center. In this scheme it is necessary for the applicant to defend his/her proposal in front of a panel of experts and obtain the recommendation for admission. Under this program, fellowship is not assured but, one can avail of either Dr. T.M.A. Pai Fellowship (offered by MAHE on a competitive basis) or by clearing NET. In some cases, the scholar may be supported by the mentoring faculty under an externally sponsored project.

From the AY 2021-22, MCNS is offering an ‘Integrated Ph.D. program, in addition to the existing regular Ph.D. program. The Integrated Ph.D. program aims to attract talented and dedicated Bachelor’s degree holders with a keen sense of scientific enquiry and motivation to pursue high priority research in frontier areas of Basic Sciences. This program is offered on a full-time basis for a minimum period of five and a half years. The first 2 semesters of the program would cover the essential subjects at the Master’s level, and specific courses mandatory for a Ph.D. The 3rd and the 4th semesters would be devoted entirely for a research project work at the Master’s level. The 5th semester and beyond would be for research towards the Ph.D. degree. Proceeding to the 5th semester is based on the candidate’s performance and on the recommendation of the Master’s

Advisory Committee. Students not recommended to, or not willing to continue for the Ph.D. program, would exit after the 4th semester with an M.Sc. by research degree, subject to eligibility.

A variety of elective courses are offered in the program. The courses are so designed by experts as to facilitate strong foundation in the selected discipline, as well as to incorporate inter-disciplinary elements to encourage cross-pollination of ideas and concepts. Laboratory experiments are devised to enhance concept-based learning and a variety of scientific skills. The academic program is tightly integrated with computation, laboratory and field work. Invited seminars and talks by national and international experts are regular events at the Centre. Students participating in on-going research activities in an individualized environment will find it congenial for learning of a broad range of practical skills.

### Advisory Group

MCNS is supported by an Advisory Group that provides valuable and timely scientific, technical and policy inputs and recommendations, on quality and content of existing and intended academic programs to help in expanding its circle of visibility.

### Infrastructure

#### High Performance Computer Cluster “Shakti”

A dedicated high-performance computer cluster “Shakti” with fully parallel architecture is available for use by faculty and advanced level students at MCNS. Computing power and performance are kept upgraded as required.

#### Library and video conferencing

The Centre has a dedicated full-service library to support education and research in the natural sciences.

The library currently offers a wide range of e-resources and services to assist fundamental research in physical and earth sciences with digital access available to over 400+ full text journals and selected archives.

There are currently four sections: periodicals (both physical journals and digital subscriptions), reference, textbooks and multimedia. Library management is fully computerized.

### Laboratories

MCNS currently has 9 research and teaching laboratories. Research laboratories include Physics (Neutron source lab, HPGe lab, PG lab), Chemistry (Synthetic & Material Chemistry), Earth Sciences (Evolutionary Biology, Palynology lab, Geology lab, Remote sensing lab) and a Computing lab. In addition, an astrophysics set-up with a 12-inch telescope and peripherals (2014) are available. Experimental and computational skills are integrated into programs offered at the MCNS. An indigenously designed and fabricated table-top accelerator is available (2018) at the Centre for teaching and research. This equipment was designed and built, in technical collaboration with the Inter University Accelerator Centre (IUAC), New Delhi.

### Dr. T.M.A. Pai Planetarium

The Dr. T.M.A. Pai Planetarium is located on the banks of the beautiful Manipal Lake. This distinctively designed four-level building is also home to MCNS. The Carl Zeiss sky telescope within the Sky Theatre provides a year-round live sky experience to budding astronomers of all ages. It is also used as a teaching aid and astronomy lab for students and lifelong learners. This is the only planetarium in the country to co-exist within a research Centre in a prominent university. The integration of the planetarium activities with advanced research provides an exclusive platform for science outreach in the frontier areas of contemporary science.

Daily shows at the 70-seater Sky Theatre and special events held at the exhibit lobby are conducted on a not-for-profit basis. Four new shows were introduced in the previous year. The planetarium also organises a variety of special interest events to mark important scientific occasions including new discoveries.

Apart from astronomy, outreach activities in natural history, birding, biodiversity, conservation of the Western Ghats and appreciation of our rich natural heritage are also encouraged. Students at MCNS are encouraged to participate in a host of extra curricular scientific and academic activities. Three student clubs namely (i) Nature Club (nature walks, talks and observations) (ii) Movie Club (screening of short videos of scientific interest) and (iii) Reading Club (reading and discussion on a topical paper from a leading scientific journal) meet on a monthly basis, and are entirely managed by research scholars, to convey the excitement of new ideas and discoveries while stimulating scientific debate and discussion.

**Auditorium**

A 100+ seater auditorium with audio-visual infrastructure is available for special events, talks and seminars.

**Discovery**

Researchers working in nuclear physics at MCNS have co-discovered 5 new isotopes while the observational astrophysics group has found new celestial objects. Paleontologists at MCNS have found unique micro-fossils and co-discovered a Jurassic era fossilized Ichthyosaur.

**Advantages**

Research at MCNS is in niche, emerging and inter-disciplinary areas of science, which makes the Centre a unique research destination. The Post-Doctoral program, a first at the Manipal Academy of Higher Education, is specially structured to nurture independence and creativity in research, and collaborates with similar programs abroad, to encourage exchange and mobility.

MCNS provides a stimulating environment towards a future scientific leadership in the emerging fields, by encouraging blue sky research in all the branches of Natural Sciences. MCNS is also recognised as one of the Inter-University Centre for Astronomy and Astrophysics (IUCAA) for Astronomy Research and Development.

**Research Excellence in Numbers**

No. of Research Scholars at the PhD level	4
No. of PhDs awarded	2
JRFs / SRFs/ Project Associates (present)	1
Total no. of Journal publications (Reputed journals) -	176
With National collaboration	86
With International collaboration	73
Books published	4
Book chapters	7
Completed Sponsored Research Projects	18
Ongoing Sponsored Research Projects	2
Research Projects (MCNS supported)	18
Grant funding proposals submitted	5
Research Grants	3,72,26,956 INR
Fellowship	1 INSPIRE fellowship
Student projects: MSc. /M.Tech. (completed)	20
M.Sc. (on going)	3
M.Sc./M.Tech. (on going)	3
Workshops /schools	7
<ol style="list-style-type: none"> <li>School on Algebraic Surfaces</li> <li>Math days in Manipal-Workshop on Algebraic Geometry-2015</li> <li>School on 'Recent Trends in Astrophysics and Cosmology'-2014</li> <li>Multi-wavelength study of the blazar: data acquisition and theoretical modeling-2013</li> <li>School on 'Observing Universe with AstroSat'-2018</li> <li>School on "Invitation to Particle Cosmology"-2018</li> <li>Workshop on "Plant Inventory Methods-I" - 2022</li> </ol>	
Summer Research Internship Program (annual)	9
Seminars & talks	158
Club events conducted	74
Conference, workshop attended	210
Invited talk at conferences	48

**Collaborations & Partnerships**

Researchers at MCNS derive benefit from continuous interaction with eminent scientists of national and international repute, some of whom are a part of the Advisory Group of MCNS. Active formal and informal collaborations with well-known academic and research institutions, and renowned academicians provide exceptional opportunities to explore new research directions.



## Ph.D.

### Duration

Minimum 3.5 Years (Post M.Sc.)

### Eligibility Criteria & Admission Process

Refer Section 2

### Course Fees, Hostel Fees, Refund Rules

Refer Section 3

### Last date to apply and

Commencement of Classes: Refer

<https://manipal.edu/datestoremember>



### Program Description

This regular Ph.D. program is open for students with Master's degree, highly meritorious, and motivated towards fundamental research in Natural Sciences such as physics, chemistry, earth and planetary sciences, evolutionary and developmental biology.



### Focus

The focus would be on a frontier problem in the chosen discipline. Added courses and projects would aim at building the student's strength in the concept, and in the experimental, analytical, modeling and computational skills, towards understanding a complex natural phenomenon, even while pursuing studies for the Ph.D. degree.



### Career Prospects

Since the emphasis is on high quality research work, a student obtaining Ph.D. degree under this program would have acquired remarkable skills in research, from approach to the problem to its solution, and hence would have a competitive edge while seeking an academic position or employment as a professional researcher in a reputed institution in India or abroad.

## Integrated Ph.D.

### Duration

Minimum 5.5 Years (MSc 2 year + PhD 3.5 year)

### Eligibility Criteria & Admission Process

Refer Section 2

### Course Fees, Hostel Fees, Refund Rules

Refer Section 3

### Last date to apply and

Commencement of Classes: Refer

<https://manipal.edu/datestoremember>



### Program Description

This Integrated Ph.D. program is open for students with Bachelor's degree, highly meritorious, and motivated towards fundamental research in Natural Sciences such as physics, chemistry, earth and planetary sciences, evolutionary and developmental biology. However, for the current academic year, only Physics discipline is available, with a choice of specialization in (i) Astrophysics, (ii) Nuclear Physics. A student in this program, would complete the courses mandatory for a Ph.D., along with the courses essential for an MSc., during the first two semesters, and also acquire ample research experience by working on a research project, during the 3rd and the 4th semesters. Ph.D. level work begins at the 5th semester. Student who successfully completed up to

fourth semester can also opt to exit the program with a Msc by Research degree in Physics. Such a student would be more equipped, than a regular MSc student, while beginning to do Ph.D. level work.



### Focus

The focus would be to bring out the research skills of a motivated Bachelor degree student. Added courses and projects, at Master's and Ph.D. levels, would aim at building the student's strength in the concept, and in the experimental, analytical, modeling and computational skills, towards understanding a complex natural phenomenon, even while pursuing studies towards the Ph.D. degree, on a frontier problem in the chosen discipline.



### Career Prospects

Since the emphasis is on high quality research work, a student obtaining Ph.D. degree under this program would have acquired remarkable skills in research, from approach to the problem to its solution, and hence would have a competitive edge while seeking an academic position or employment as a professional researcher in a reputed institution in India or abroad.

A student opting to exit after obtaining MSc degree would be more equipped, than a regular MSc student, to join a PhD program elsewhere.

