



भारतीय प्रौद्योगिकी संस्थान पटना Indian Institute of Technology, Patna

IITP/ACAD/Ph.D./2022-23/1
Dt 29.03.2022

Ph.D. Admission – July 2022 (Autumn Semester, AY-2022-23)

Applications are invited for admission to the Doctor of Philosophy (Ph.D.) programme, starting in July 2022 in the following Departments. The areas of research in IIT Patna are as follows:

| <i>Department</i> | <i>Areas of Research</i> |
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| <i>Chemical & Biochemical Engineering</i> | Ambient pressure NH ₃ formation using heterogeneous catalysis Artificial Intelligence in Process system engineering Carbon foot printing Chemical Kinetics and Catalysis condensation and evaporation Continuous downstream processing Crystallization Data driven optimization Energy and Exergy management Food processing Process system engineering Ice-nucleation lubrication of Nano Particle-solvent system Microwave Assisted Material Processing Molecular Modeling and Simulation Phase behaviour of confined fluid Phase change materials Photocatalyst for CO ₂ reduction and N ₂ fixation Photoelectrochemical processes for clean energy Pinch Analysis Plasma catalysis Process design and optimization Process Integration Production planning Reactive distillation Renewable energy integration Renewable Energy Sources and Their Applications plastic to fuel using renewable energy sources. Robust optimization Scheduling and optimization Separation processes Stochastic optimization Sustainable chemical processing Computational Fluid dynamics Treatment of Pharmaceutical Waste Wastewater Treatment using Advanced Oxidation Processes Wetting and interfacial properties of Ionic Liquid and Deep Eutectic Solvent |

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| <p>Chemistry</p> | <p><i>Organic, Inorganic, Physical, Theory, Biochemistry/Biomaterials, Polymer and Materials Chemistry</i></p> |
| <p>Civil & Environmental Engineering</p> | <p>Specialization: Structural Engineering</p> <p><i>Mechanics of Geopolymer Concrete</i> <i>Multiscale Modeling of Li-ion Battery</i> <i>Smart Material for Vibration Control</i> <i>Structural Engineering</i> <i>Structural dynamics and earthquake engineering</i> <i>Structural stability</i> <i>Structural Fire engineering</i></p> <p>Specialization: Geotechnical Engineering</p> <p><i>Ground Improvement</i> <i>Geoenvironmental Engineering and Biogeotechnics</i> <i>THMC behaviour of unsaturated soil</i> <i>Energy Geotechnics</i> <i>CO2 sequestration</i> <i>Rock Mechanics and Underground Excavations</i></p> <p>Specialization: Transportation Engineering</p> <p><i>Pavement Analysis and Design</i> <i>Pavement Materials Engineering</i> <i>Railway Engineering</i> <i>Traffic Engineering</i> <i>Traffic flow Theory</i> <i>Intelligent Transportation Systems</i></p> <p>Specialization: Environmental Engineering</p> <p><i>Water and Wastewater Treatment</i> <i>Waste Treatment and Resource Recovery</i> <i>E-waste Management</i> <i>Removal of Micro-plastics and Emerging Contaminants from Aqueous Matrices</i></p> <p>Specialization: Hydraulics and Water Resources Engineering</p> <p><i>Open Channel Hydraulics</i> <i>Geoinformatics application in Water Resources</i> <i>Surface Water Hydrology</i></p> |

**Computer
Science and
Engineering**

All areas including (but not limited to)
802.11 Wireless Network
Adhoc Networks and Sensor Networks
Analog EDA
Big Data Computing
Bioinformatics
Biomedical Imaging
Bio-Text Mining
Blockchain and Smart Contract
CAD for VLSI
Cloud Computing
Cloud Security
Complex Networks
Computational biometrics and forensics
Computer Vision
Consensus in Blockchain
Database & Data Mining Applications
Deep learning
Discrete Event Modeling
Distributed Systems
Empathetic Conversational Artificial Intelligence and Affective Computing
Energy management & Intelligent transportation systems
Fault-Tolerant Computing
Federated Learning
Formal Methods for Analysis and Verification
Hardware Security
Human-Computer Interaction
Image Processing
Information Extraction
Information Systems Security
IoT Security
Machine Learning
Machine learning Security
Malware detection
Medical image analysis
Mobile Social Computing
Modeling of social networks
Multimodal Artificial Intelligence
Multiobjective Optimization
Natural Language Processing
Online Algorithms
Pattern Recognition
Programming Languages
Reinforcement learning
Security & Privacy
Service recommendation
Social Networks
Soft Computing
Text Mining
VLSI Design and Methodologies
Wi-Fi Security, Wireless Networking

**Electrical
Engineering**

Power Electronics
Electric Drives
Power Systems
Smart Grid
Power System Protection
Power System Stability
Control System
Semiconductor Device and Circuits,
Design and Fabrication
Optoelectronic Devices
Sensor
Solar cell
Photodetectors
Semiconductor Device and Circuits for Low Power and Neuromorphic Computing
VLSI and Embedded System
Radio Frequency Integrated Circuits (RFIC)
Analog Integrated Circuits (AIC)
Wireless Sensor Networks
Internet of Things (IoT)
Molecular Communications
Machine Learning
Deep Learning
Digital Signal Processing
Digital Image Processing
Digital Video Processing
Video Surveillance
Multimedia Communication
Tele-medicine
Biomedical Signal and Image Processing
Neuroscience
Neuro-cognition
Wearable Healthcare Monitoring
mm-Wave Antennas for 5G and Beyond
High Gain Beam Scanning Metasurface Antennas
Digital Metasurface and Applications in 5G and Beyond (IRS)
Metamaterial Absorber for Stealth Application
SDR Based Radar for Detection and Ranging
Wireless Communication
5G and Beyond
6G and Signal Processing for Communication and Wireless Communication
Optical Communication
Photonics for Artificial Intelligence
Optical Fiber based Sensing

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|---|--|
| <p>Humanities and Social Sciences</p> | <p>Economics <i>Macroeconomic Reforms</i> <i>Trade and investment</i> <i>Microeconomics</i> <i>Labour Economics</i> <i>Development Economics</i></p> <p>English <i>ELT</i> <i>Gender Studies</i> <i>Indian English Fiction</i> <i>Migration and Diaspora Studies</i> <i>Myth and Literature</i> <i>Digital Humanities</i> <i>Posthumanism</i> <i>South Asian Fiction</i></p> <p>Linguistics <i>Cognitive Linguistics and Forensic Linguistics</i> <i>Morphology</i> <i>Phonetics & Phonology</i></p> <p>Management <i>Applied Psychology</i> <i>Human Resource Management</i> <i>Industrial and Organizational Psychology</i> <i>Organizational Behavior</i></p> <p>Social studies <i>Health Care Management</i> <i>Social Networks</i> <i>Gender and Development</i> <i>Migration and Development</i> <i>Population and Public Health</i> <i>Public Policy</i> <i>Regional Development</i> <i>Sociology of Education</i></p> |
| <p>Metallurgical & Materials Engineering</p> | <p><i>Plasma Spray Coating, Mechanical Properties of Materials, Friction stir processing and welding, Metal and Ceramic Matrix nano composites, Tribology of Materials, Process-structure-property Relationship, Solid State Chemistry, Materials Chemistry, Nanoparticles for Energy, Structural and Functional Applications, Structure- Property correlation of Dielectric, Ferroelectric, Multiferroic and other energy conversion Materials, Flash sintering of ceramics, Microstructure - property correlation in ceramics, Polymer blends and alloys, Polymer nanocomposites, Nanofillers, Hybrid nanofillers, Carbonaceous nanofillers like carbon dots and graphene</i></p> |

Mathematics

Reliability Estimation

Survival Analysis

Estimation under Censored Data

Statistical Inference

Numerical Analysis

Moving Mesh Methods

Singular Perturbation

A posteriori Error Estimates

ordinary differential equation (ODE)

partial differential equation (PDE)

Integral Equations

Fractional Order Equations

Nonlinear Problems

Black Scholes Equations

Mathematical Finance

Nonlinear Programming

Vector Variational Inequalities; Differential Manifolds

Rings and Modules

Algebraic Coding Theory

Algorithmic graph theory

Theory of Inregral Transforms

Monotone Iterative Techniques

Non standard Finite difference techniques

Existence and Uniqueness of Nonlinear Boundary Value Problems

Biomathematics

Mathematical sequence design

Dynamical Systems

Mathematical Control Theory, Optimal Control

Polynomial identities on rings, Differential geometry

**Mechanical
Engineering**

Design:

*Computational Mechanics (FEM/XFEM)
Condition Monitoring of Gear Box and Bearing
Continuum Mechanics
Cyclic Plasticity
Fatigue and Fracture Mechanics
Mechatronics
Micro Electromechanical (MEMs) Devices
Robotics
Smart Materials and Devices
Tribological Machine Element Design
Vacuum Tribology*

Manufacturing:

*Additive Manufacturing
Advanced Metallic Materials
Cyber Physical Machine Tools
Digital Manufacturing
Finite Element Modeling of the Welding Processes
Friction Stir Welding/Processing
Green manufacturing
In situ Analysis of Manufacturing Processes
Mechanical Micromachining
Non-traditional Micromachining
Sheet Metal Forming
Surface Engineering*

Thermal and Fluids:

*Artificial Intelligence and Machine Learning Tools for Heat Transfer Problems
Biofluid Dynamics
Biomicrofluidics
Biophysical Aerodynamics
Boiling Heat Transfer
Bubble Acoustics
Condensation Heat Transfer
Computational Fluid Dynamics
Energy
Fluid-structure Interaction
Hydrodynamic Stability
Hypersonic
Microfluidics and BIOMENS
Micro-nanostructured Surface Fabrication
Rarefied Gas Flows
Solar Thermal
Turbulence Modelling
Wettability*

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| Physics | <p>Optics and Photonics: <i>Ultrafast Spectroscopy & Biophysics, Applied Optics (optical signal processing, information security), Digital Holography, Biophotonics, Nano-optics, Nanophotonics</i></p> <p>High Energy Physics: <i>High Energy Physics Phenomenology</i></p> <p>Condensed Matter Physics: <i>Multiferroics, Magnetic materials, Nanostructured materials, Magnetocaloric materials, Electrocaloric materials, Heusler alloys, Solid State Cooling, Nanomaterials for Energy and Sensing, High-Temperature Superconductors, Nanoscale device applications based on atomic switch technology, Renewable Energy Materials & Devices, EMI Shielding, Ferroelectrics & Dielectrics, Organic electronic devices, Nanoelectronics, Spintronics, 2D Materials</i></p> <p>Computational atomic Physics: <i>e-scattering, photoionization electronic structure calculation strong field ionization</i></p> |
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Applicants having external fellowship from recognized Government funding agencies are encouraged to apply.

CATEGORY OF ADMISSION:

The Institute admits Ph.D. students under the following categories:

1.1 REGULAR and FULL-TIME

A student in this category works full-time for her/his Ph.D. degree. They can be classified as:

1.1 a) INSTITUTE FELLOWS

S/he receives assistantship from the Institute. The qualifying Degree for Financial Support is:

1.1.1 BE/ BTech/ MSc/ MA/ MBA/ MCA /equivalent degree with valid GATE score above the prescribed cut off level/ NET qualification.

B.Tech from IITs with CGPA 8.0 and above are exempted from GATE qualification as per MHRD (*now MoE*) letter no. 17-2/2014-TS.I dated Feb 18, 2015.

1.1.2 ME/ MTech/ MPhil /equivalent degree with GATE/ NET qualification.

Age Limit: Please refer to Eligibility Criteria for Admission into Ph.D. Programme

1.1 b) RESEARCH FELLOWS (JRF/SRF)

S/he receives fellowship from any government recognized funding agencies, such as CSIR, UGC, DBT, NBHM, DST (INSPIRE programme), etc

1.2 SPONSORED

A student in this category is sponsored by a recognized industrial R&D organization, academic institution (universities/colleges), government organization (defence or other ministries of the Government of India or any other government organizations including PSUs and autonomous bodies) or reputed industries (as may be recognized by this Institute) for doing research in the Institute. The Institute does not provide any assistantship/fellowship to such a student.

Candidate in Sponsored category must be a regular employee of the sponsoring organization (of repute) with a minimum of two-year job experience in the respective field. A student in this category

is therefore a professionally employed person, who pursues Ph.D. while continuing her/his services. The candidate has to work full time in institute to obtain the degree for a period of 3 years. **An intending sponsored candidate must produce NOC on the day of interview in the prescribed format: Form I, available in the website, link <https://www.iitp.ac.in/acad/admission.php>**

1.3 SELF-FINANCED

A student in this category may work full-time towards the Ph.D. Programme. The Institute does not provide any assistantship/fellowship to such a student. The applicant should have qualified a national level exam (NET/GATE).

1.4 PROJECT STAFF

This category refers to a student who, as a project staff, is working on a sponsored project (registered in R&D Unit, IIT Patna). The said project staff is eligible to be admitted in the Ph.D. Program (of this Institute) to work on a full-time basis. The minimum remaining duration of the project at the time of admission as well as tenure of the project employee should be at least 2 years from the date of joining the Ph.D. program. **She/he must have qualified GATE/NET.**

If the project gets completed before the student completes her/his Ph.D., her/his category will no longer be that of Project Staff and her/his category will be converted to that of SELF-FINANCED unless she/he is granted an assistantship/fellowship from the Institute or any other agency.

A project staff intending to join the Ph.D. program of IIT Patna must produce NOC on the day of interview in the prescribed format: **Form II, available in the website, link <https://www.iitp.ac.in/acad/admission.php>** for admission through Principal Investigator, Head of the Department and Dean/ Associate Dean R&D with suitable endorsement.

1.5 EMPLOYED & PART-TIME

A candidate in this category is a regularly employed person (including the staff of IIT Patna), who pursues the Ph.D. program, while continuing the duties of her/his service. The institute does not provide any assistantship/ fellowship to such a student. The minimum residential requirement is one or two semester(s) depending on the completion of mandatory course work required for Ph.D. students. Candidate in Employed and Part-time category must be a regular employee of his/her organization with at least two years of professional experience in the respective field. **The work-experience of minimum two years is essential with current employer.** NOC must be produced on the day of interview in the prescribed format: **Form III, available in the website, link <https://www.iitp.ac.in/acad/admission.php>**

Minimum Eligibility Criteria for Admission to Ph.D. Programme:

In all the disciplines, the upper **age limit is 28 years (B.Tech./B.E./M.Sc./MA/MCA/MBA) and 32 years (M.Tech./M.E./M.S./M.Phil.)** to be calculated as on the last date of application and is applicable **only** for candidates applying in Regular and Full time category, as institute fellow. For Research/ project fellows, age limit will be as per the funding agency norms. In absence of any age criteria, the Institute norms will be followed. Upper age limit is relaxed up to 05 years in case of candidate belonging to Schedule Castes/Schedule Tribes, Women, Physically Handicapped and OBC applicants.

A.1 Ph.D. in Engineering

For admission to the Ph.D. Programme in Engineering Department, a candidate must satisfy one of the following criteria:

A.1.1 Candidates having M.Tech./M.E. degree in a Engineering/Technology, with a minimum CPI of 6.5 or 60% of marks.

A.1.2 Bachelor's degree in Engineering/Technology (from any Institute other than IITs) in a relevant area with a minimum CPI of 8.0 or 75% of marks.

A.1.3. Bachelor's degree from an Indian Institute of Technology (IIT) in a relevant area with a minimum CPI of 7.0.

A.1.4. Master's degree in Science in a relevant area with a minimum CPI of 7.5 or 70%.

A.2 Ph.D. in Science

For admission to the Ph.D. Programme in Science departments, a candidate must satisfy one of the following criteria:

A.2.1 M.Phil. or Master's degree in Science in a relevant area with a minimum CPI of 6.5 or 60% of marks.

A.2.2 Master's degree in Engineering/Technology in a relevant area with a minimum CPI of 6.5 or 60% of marks

A.2.3 Bachelor's degree in Engineering/Technology from an Indian Institute of Technology (IIT) in a relevant area with a minimum CPI of 7.0.

A.2.4 Bachelor's degree in a related area in Engineering/Technology (from any Institute other than IITs/IISc) in a relevant area with a minimum CPI of 8.0 or 75% of marks.

A.3 Ph.D. in Humanities and Social Sciences

For admission to the Ph.D. Programme in the department of Humanities and Social Sciences (HSS), a candidate must satisfy one of the following criteria:

A.3.1 M.Phil. or Master's degree in Arts/Commerce/Science in a relevant area with a minimum of 55% marks or equivalent.

A.3.2 Master's degree in Engineering/Technology/Design in a relevant area with a minimum CPI of 6.5 or 60% marks.

A.3.3 Bachelor's degree from an Indian Institute of Technology (IIT) in a relevant area with a minimum CPI of 7.0.

A.3.4 Bachelor's degree in Engineering/Technology (from any Institute other than IITs/IISc) in a relevant area with a minimum CPI of 7.5 or 70% marks.

Candidates should note that if both CPI/CGPA and percentage are indicated in transcript/marksheet of the qualifying degree then only CPI/CGPA shall be taken into account for determining eligibility.

Direct Admission (Waiver of Entrance Test):

For candidates in Sciences, Engineering & Technology:

The Institute may admit exceptionally bright students and Full-time (Institute Fellows) directly (i.e., without entrance test) into the Ph.D. program.

Eligible candidates meeting one of the following criteria may be considered for a waiver of the entrance test:

1. B.Tech. from the IITs, graduated within the last five years, with a degree in the respective discipline with a CPI/CGPA of 8/10 and above.
2. Masters from the IITs/IISc, graduated within the last five years, with a degree in the respective discipline with a CPI/CGPA of 8.5/10 and above.

Such a candidate has to apply online. Additionally, an email must be sent with scanned copy of the supporting documents to aracademic@iitp.ac.in

There would be no admission in direct admission category in Department of Humanities and Social Sciences.

Relaxation for SC/ST Candidates:

Eligibility criteria will be relaxed by 5% marks or 0.5 CPI for SC/ ST applicants.

Reservations:

The reservation of seats in admissions for SC, ST, OBC, EWS categories and for Persons with Disability (PwD) will be as per Government of India rules. OBC (Non-creamy layer) candidates will have to produce certificate and self-declaration statement as per formats indicated at Annexure- I and II available in the website, link <https://www.iitp.ac.in/acad/admission.php>

FINANCIAL SUPPORT:

The Institute assistantships will be available to eligible (Indian) students as per prevailing (MoE, GoI) norms, as applicable from time to time. At present total emoluments are Rs 31,000/- per month.

Assistantships from external funding organizations will be available as per terms and conditions of the concerned funding organizations.

Students receiving assistantships from the Institute or fellowships from any other funding agencies are required to perform academic duties as per prevailing norms.

The continuation of the assistantship/fellowship is subject to satisfactory performance of the assigned duties and satisfactory progress of the student in the Ph.D. Programme.

APPLICATION PROCEDURE (go through it very carefully):

Firstly, application fee must be paid before proceeding for online application. The details of application fee are given below:

| Category | Male | Female |
|-----------------|----------|----------|
| GEN/EWS/OBC-NCL | Rs 300/- | Rs 150/- |
| SC/ST/PwD | Rs 150/- | Rs 150/- |

The application fee should be paid online through SBI Collect. Application fee shall not be refunded.

Link for payment: <https://www.onlinesbi.com/sbicollect/icollecthome.htm?corpID=595859>

After the payment, a reference/journal number will be generated, which must be mentioned in the application form and the printed e-receipt of payment must be preserved carefully.

Only after the above step and noting down reference/journal number generated through payment, candidates are required to use the following link to fill and submit application form online. Please read complete advertisement very carefully before applying online. To avoid internet congestion, candidates are advised not to wait for the last date of application.

Link for online application (should be accessed after payment):

https://www.iitp.ac.in/phd_admission/phd_form

After successful online application, candidates shall receive application details to the registered email address.

Candidates, applying for more than one department, must submit a separate application with separate fee- payment. Fresh fee payment is required for each application.

The candidates are required to take printout of the application details received in email after submitting online application. This printout along with self-attested copies of mark sheets & certificates (from class X to highest degree obtained/appeared), caste certificate (if applicable),

GATE /NET/Relevant certificate related to any fellowship, experience certificate, other testimonials (both sides), and printed e-receipt of online payment must be produced on the day of test/interview, failing which the candidature is liable to be rejected.

If any of the prescribed documents (as mentioned above) is not produced on the day of test/interview, then attending test/interview may not be allowed.

Please note that depending upon the situation, above documents can be asked any time before the day of interview.

Candidates are NOT required to send application by post.

No call letter will be sent by post. The candidates must check email and website regularly for important information. On the day of test/interview, a candidate must produce his/her valid original Identity card.

Selection:

The Institute reserves the right to call a limited number of candidates for test/interview, based on performance in GATE/NET, grades/marks in the qualifying examination, shortlisting criteria etc and merely fulfilling minimum eligibility criteria does not guarantee call for test/interview.

Important Dates:

Start Date of On-line Application: 29.03.2022

Last Date of On-line Application: 20.04.2022

Important: - One should not drop /leave the programme before course completion. Selected candidates shall have to submit an undertaking/declaration at the time of admission for refunding fellowship/assistantship drawn from the institute in case of resignation from the programme.

Helpline: Please note that no correspondence / query shall be entertained regarding correction of mistake in the submitted application, details already available in the advertisement and irrelevant matters. First issues/problems should be identified strictly as provided in the following table and use ONLY the concerned link/ email id mentioned against the issues.

| S.N. | Issues | |
|------|---|---|
| 1 | Technical issues regarding online application | https://forms.gle/ZSXd4K6s8iQ81j7c9 |
| 2 | Academic matter | acadphd@iitp.ac.in 06115-233-684/697 |
| 3 | Fee -payment/ SBI collect | arfa@iitp.ac.in 06115-233-062 |

Note: The above information is not the complete set of Rules & Regulations for the Ph.D. programme of IIT Patna

Legal Jurisdiction: The court at Patna alone shall have the jurisdiction to settle and decide all matters and disputes related to the above referred admission process.