

**INDIAN INSTITUTE OF TECHNOLOGY (BANARAS HINDU UNIVERSITY)  
VARANASI – 221 005**

**Information Brochure for Admission to Ph.D. Programmes for Even Semester of the  
Academic Session 2016-17**

The P.G. programmes of the Indian Institute of Technology (Banaras Hindu University), Varanasi are aimed at training manpower with sound theoretical and experimental background in frontier areas of research in the engineering, sciences and interdisciplinary subjects. The emphasis is on understanding the scientific basis and engineering principles involved in solving problems of practical importance in the relevant field using multidisciplinary approach. An important component of these programmes is to inculcate the habit of independent thinking and initiative by the candidates in planning and execution of the research work. These programmes seek to train manpower of the highest quality to cater to the needs of industry, R & D organizations and educational institutions.

The Institute has 10 Engineering 3 Science and 1 Humanistic Studies Departments and 3 Interdisciplinary Schools which offer PG programmes in the respective disciplines. Joint registrations for Ph.D. programme involving more than one department/ school are encouraged to promote multi-disciplinary research.

Duly filled-in on-line applications on the prescribed form on our website are invited for admission to Ph.D. programmes for registration in Even Semester of session 2016-17 in various disciplines as given in Annexure–I. Candidates whose qualifying examination results are not declared at the time of written test / interview are also eligible to apply. However such candidates if shortlisted, are required to produce a certificate on the prescribed form at the time of written test that the candidate has already appeared in all the papers of the qualifying examinations and the result is not yet declared. In case the candidate is selected, he/she has to submit the proof of having passed the qualifying examination on or before the last date for document submission specified in the academic calendar of the institute.

All forms mentioned in this document are made available on the admission portal. Please use the links provided in the instructions given therein.

## **ELIGIBILITY CONDITIONS**

### **Ph.D. Programmes**

Applicants must have the requisite qualification with minimum marks/CPI as mentioned below in the discipline concerned or in an allied discipline/area. A list of allied disciplines and research areas currently available for Ph.D. Programmes is given in Table 1A and 1B respectively of Annexure – I. The number of seats available for Ph.D. Programmes in different disciplines are given in Table 1C of Annexure-I.

Applicants who qualified in CSIR/UGC-NET-JRF may be offered admission after an interview as and when they apply for admission to Ph.D. programmes in Departments/Schools where sciences are allied disciplines. However, they should be recommended to register formally for the programme at the next available semester. Such candidates with CSIR/UGC-NET-JRF qualification who are applying for admission in response to advertisement for the current session will go through similar procedure of selection as above.

### **Ph.D. in Engineering**

- a) Applicants with master's degree in engineering in the discipline concerned or in an allied discipline/area must have a minimum of 60% marks or 6.0 CPI (on a 10.0 point scale) at the master's degree level and have GATE qualification.

- b) Applicants with bachelor's degree in engineering in the discipline concerned or in an allied discipline/area must have a minimum of 75% marks or 7.5 CPI (on a 10.0 point scale) at the bachelor's degree level. The applicants should be qualified in GATE for the award of Institute Assistantship.
- c) Applicants with master's degree in science as an allied discipline/area (where science is an allied discipline/area), must satisfy each of the following criteria:
  - (i) A minimum of 65% marks or 6.5 CPI (on a 10.0 point scale) at the master's degree level,
  - (ii) A minimum of 60% marks or 6.0 CPI (on a 10.0 point scale) at the bachelor's degree level, and
  - (iii) Qualified in GATE or NET-LS or CSIR/UGC-NET-JRF or awarded DBT-JRF or ICMR-JRF or DST-INSPIRE fellowship.

#### **Ph.D. in Pharmacy**

- a) Applicants with master's degree in pharmacy or in an allied discipline/area must have a minimum of 60% marks or 6.0 CPI (on a 10.0 point scale) at the master's degree level and have GATE/GPAT qualification.
- b) Applicants with bachelor's degree in pharmacy must have a minimum of 75% marks or 7.5 CPI (on a 10.0 point scale) at the bachelor's degree level. The applicants should be qualified in GPAT or GATE or NET-LS or CSIR/NET-JRF or awarded DBT-JRF or ICMR-JRF or DST-INSPIRE fellowship.

#### **Ph.D. in Sciences**

- a) Applicants with master's degree in science in the discipline concerned or in an allied discipline/area must have a minimum of 60% marks or 6.0 CPI (on a 10.0 point scale) at the master's degree level and qualified in GATE or NET-LS or CSIR/UGC-NET-JRF or awarded DBT-JRF or ICMR-JRF or DST-INSPIRE fellowship.
- b) Applicants with four year bachelor's degree in Science in the discipline concerned or in an allied discipline/area must have a minimum of 75% marks or 7.5 CPI (on a 10.0 point scale) at the bachelor's degree level. They should be qualified in GATE or NET-LS or CSIR/UGC-NET-JRF or awarded DBT-JRF or ICMR-JRF.

**Note:** For Ph.D. in Engineering and Sciences the B.Tech. graduates from IITs and other centrally funded technical institutions getting a CGPA score of 8.00 or above (on a scale of 10) would also be entitled to the assistantship without having to appear in GATE.

#### **Ph.D. in Humanistic Studies**

- a) Applicants with Master's degree in relevant subject or allied subjects with a minimum CPI of 6.00 on a 10.0 point scale (or 60% marks) in the qualifying degree.  
Applicants should be qualified in UGC -NET-JRF.
- b) Applicants with Master's degree in Science or allied subjects with a minimum CPI of 6.00 on a 10.0 point scale (or 60% marks) in the qualifying degree.  
Applicants should be qualified in CSIR/UGC-NET-JRF or in GATE.
- c) Applicants with Bachelor's degree in Engineering or Sciences (4-Year program) with a minimum CPI of 7.50 on a 10.0 point scale (or 75% marks) in the qualifying degree with qualified GATE Score.

#### **Interdisciplinary Programmes**

##### **a) Ph.D. in Systems Engineering**

Applicants with a bachelor's and master's degree in any branch of Engineering must have a minimum of 60% marks or 6.0 CPI (on a 10.0 point scale) at the master's degree level and have GATE qualification.

Applicants with bachelor's degree in any branch of engineering must have a minimum of 75% marks or 7.5 CPI (on a 10.0 point scale) at the bachelor's degree level. The

applicants with bachelor's degree should also be qualified in GATE for the award of Institute Assistantship.

**b) Ph.D. in Industrial Management**

Applicants with bachelor's degree in any branch of engineering and master's degree in any branch of engineering/ management must have a minimum of 60% or 6.0 CPI (on a 10.0 point scale) at the master's degree level and have GATE qualification.

Applicants with bachelor's degree in any branch of engineering must have a minimum of 75% marks or 7.5 CPI (on a 10.0 point scale) at the bachelor's degree level. The applicants with bachelor's degree should also be qualified in GATE for the award of Institute Assistantship.

**c) Ph.D. in Bio-chemical Engineering/Bio-medical Engineering/Materials Science and Technology**

Applicants with master's degree in the discipline concerned or in an allied discipline must have a minimum of 60% or 6.0 CPI (on a 10.0 point scale) at the master's degree level and have GATE qualification.

Applicants with bachelor's degree in the discipline concerned or in an allied discipline must have a minimum of 75% marks or 7.5 CPI (on a 10.0 point scale) at the bachelor's degree level. The applicants should be qualified in GATE for the award of Institute Assistantship.

**Admission to Ph.D. Programme for Candidates having National-level Scholarships**

There is a provision for admission to Ph.D. programmes for candidates who fulfill the eligibility criteria for the respective programmes and also have qualified in any of the national level JRF/SRF tests conducted by UGC, CSIR, Department of Biotechnology, Indian Council of Medical Research or DST-INSPIRE fellowship or Dr. K.S. Krishnan Fellowship of DAE, etc.

**Admission for candidates who come through QIP Programme**

The Institute is now recognized as Major QIP Center for research in all disciplines available. Admission procedure is as per QIP programme of AICTE.

**Admission under External Registration category**

A candidate working in an external R&D organization or in an industry recognized by the Institute (the list of external R&D organizations and industries recognized by the Institute is given in Annexure – II), which is equipped with necessary research and library facilities can also apply for admission to Ph.D. programmes, provided he/she satisfies the eligibility criteria laid down for the programme concerned. Such a candidate must show satisfactory performance in the interview, must be sponsored by his/her employer and must have been in employment with the sponsoring organization for at least two years at the time of admission.

The requirement of qualifying in GATE/GPAT is waived off for such candidates for the purpose of admission.

The employer must expressly undertake to pay full salary to the candidate and relieve him/her from the duty to enable the candidate to stay on the campus and to complete the course work requirements.

The candidate should submit a certificate (See Form IV of the Application Form) obtained from his/her organization that the research facilities of his/her organization would be made available to him/her for carrying out research. He/she should also provide the bio-data of the prospective supervisor along with his/her consent, who would be supervising the candidate's work at his/her organization.

[N.B. Letter of appointment and Form – 16 for two years of service is required from the employer at the time of interview.]

An R&D organization/industry or a research area in the specific organization may be recognised by the Institute as per the following procedure. On the recommendation of the DPGC, the SPGC will constitute a committee to assess and approve an R & D organization/ industry for admission of sponsored candidates to carry out Ph.D. research in a specified area. The committee may, upon inspection, also approve all the areas in which R & D activities are going on in that organization.

An application for admission from a candidate working in the approved organization will be considered only if he/she wishes to work in the approved area.

### **Admission of Sponsored Candidates**

A candidate who is sponsored by a teaching institution or by an R&D organization or by an industry can also apply for admission to Ph.D. programmes, provided he/she satisfies the eligibility criteria laid down for the programme concerned. He/she must have been in service of the sponsoring institution/organization for at least two years at the time of admission. The sponsoring organization must specifically undertake to provide full salary to the candidate and to relieve him/her to pursue the programme for its full duration (See Form I of the Application Form). Such candidates have to complete the requirements of the programme by staying on-campus for the full duration of the programme.

The requirement of qualifying in GATE/GPAT is waived off for such candidates for the purpose of admission.

[N.B. Letter of appointment and Form – 16 issued by your employer for two years of service is required from the employer at the time of written test / interview. In addition, the candidate must submit an undertaking that he/she will continue to submit Form – 16 for the subsequent years till he/she completes the programme.]

### **Admission of Part-time Candidates**

The Institute also offers part-time Ph.D. programmes for permanent staff and faculty members of the Institute as well as research assistants/JRFs/SRFs working in an externally funded research project running in the Institute, provided they satisfy the eligibility criteria laid down for the programme concerned. Such a candidate should submit a no-objection certificate from the Head of the Department/Coordinators of School/Principal Investigator as the case may be (See Form II & III of the Application Form as applicable).

They will be required to attend to normal duties assigned to them by the Department/School/ the Principal Investigator of the research project and attend classes to complete the course work requirements. They are also required to continue the work of Research Project till the duration for which they were appointed in the project, failing which their admission in Ph.D. Programme will stand cancelled.

## **FINANCIAL ASSISTANCE**

Financial assistance in the form of Teaching Assistantships of the Institute (Institute Assistantships) is available to the students admitted to Ph.D. programmes as per the tables given below.

### **Ph.D. Programme**

a)	<b><u>JUNIOR RESEARCH FELLOW (JRF)</u></b> Ph.D. students admitted with Postgraduate Degree in Basic Science with NET/GATE Qualification or Graduate Degree in Professional Course with NET/GATE Qualification or Post Graduate Degree in Professional Courses	Rs. 25,000/- p.m.
b)	<b><u>SENIOR RESEARCH FELLOW (SRF)</u></b> JRF Qualification with two years of research experience	Rs. 28,000/- p.m.

A student shall be assigned duties up to eight hours per week by the Departments/Schools to avail the Teaching Assistantship. The renewal of assistantship is contingent on the student's satisfactory performance in the academic programme and in the discharge of assistantship duties on a semester to semester basis.

Students admitted to Ph.D. Programme with Master's degree in Science/Arts or Bachelor's degree in Engineering/Pharmacy/4 Yr. Bachelor's degree in Science should be qualified in GATE/GPAT to avail the Institute Assistantships.

For the Even Semester of Session 2016-17, the Teaching Assistantships (Institute Assistantship) of the Institute are available for the Ph.D. programmes in each department/school as given in Table 1B of Annexure-I.

Candidates getting research fellowships/ assistantships through University Grants Commission (UGC), Council of Scientific and Industrial Research (CSIR), Department of Atomic Energy (DAE) or any other agency including sponsored research project are also eligible for admission to Ph.D. programme.

Those candidates who are getting any financial support (such as salary/ fellowship/ assistantship) from any other source shall not be eligible to avail the Teaching Assistantship of the Institute.

Admissions to the Ph.D. programme are limited only to those candidates who are qualified to get fellowship/ assistantship/ sponsorship from any of the above categories. No candidate shall be admitted to Ph.D. programme without any form of financial assistance.

## **SELECTION CRITERIA**

### **Admission to Ph.D. Programme**

1. The applicants must apply for admission by the mode prescribed in the Advertisement.
2. All admissions will be made on approval by the Chairman, Senate on the recommendations of the duly constituted selection committees and the Chairperson, SPGC. A selection committee will consist of faculty members, one of whom will be from another Department/ School. The constitution of the selection committee will be proposed by the DPGC and approved by the Chairperson, SPGC.
3. The selection committee may form separate sub-committees, if necessary, to select candidates belonging to different categories, viz., sponsored, QIP, etc. It is necessary to prepare separate merit lists for each of these cases. Notwithstanding any other clause contained in these ordinances, all such candidates should satisfy the specified minimum requirements of marks/CPI in the qualifying degree.
4. Admission to Ph.D. programmes will be based normally on written test and-interview of the candidates shortlisted by the DPGC of the Department/School concerned.

The shortlisting for calling for written test and/or interview may be done based either on the basis of percentage marks/CPI in the qualifying examination or on the basis of GATE/GPAT score. If the results of the qualifying examination for a candidate are not declared, the marks/CPI obtained by the candidate up to and including the previous semester may be considered for shortlisting.

However, outstanding candidates, who have acquired their qualifying degrees from the premier institutions such as IITs and other Centrally Funded Technical Institutions will be considered for admission without GATE, provided they have obtained a CPI of 8.0 or above (on a 10.0 point scale) in the qualifying examination. However, they have to undergo other admission procedure. This may be done at the time of shortlisting itself.

5. At first, a merit list of all applicants who have qualified in the admission test/interview mentioned in item number 3 above shall be prepared and the seats allocated to the Open Category shall be filled up in order of merit from this merit list. Remaining qualified applicants shall be allotted seats category-wise.
6. Candidates for whom results of the qualifying examination are not declared at the time of written test/interview may also be considered for written test/interview. In case such candidates are selected, their admission will be provisional subject to the condition that they produce proof of completing all the examinations including the project/thesis examination and the viva voce before the date of registration. Such candidates are required to produce the evidence of their having passed the qualifying degree examination with at least the minimum marks for eligibility by the last date for document submission as mentioned in the academic calendar (usually about 8 weeks from the date of registration), failing which their admission shall be cancelled.
7. Upon approval, the Head of the Department/Coordinator of the School concerned will issue the admission letters to the candidates who will be required to accept the offer of admission by depositing the prescribed fee before a specified date.
8. In case a candidate does not accept the offer by paying the prescribed fee by the specified date, the offer of admission may stand withdrawn, and the admission may be offered to the candidates in the waiting list, if any, in order of merit.

#### **RESERVATIONS TO SC/ST/OBC CANDIDATES:**

In each discipline, 15% seats are reserved for SC, 7.5% seats for ST and 27% seats for OBC (non creamy layer) candidates. SC/ST/OBC candidates must also satisfy the eligibility requirements for admission. However, while considering their cases, only suitability for the programme is ensured and the SC/ST/OBC candidates are not compared with those belonging to other categories.

Further, a relaxation of 5% marks or 0.5 CPI (on a 10 point scale) shall be admissible on the marks obtained in qualifying degree for SC and ST candidates in the admission.

The SC/ST/OBC certificates must be produced at the time of written test / interview on the prescribed form. In case of OBC (non-creamy layer) the certificate should not be dated later than six months **from 1<sup>st</sup> December, 2016**. The following authorities are empowered to issue the SC/ST/OBC certificate:

- (a) District Magistrate/ Additional District Magistrate/ Collector/ Deputy Commissioner/ Addl. Deputy Commissioner/ Deputy Collector/ First Class Stipendiary Magistrate/ City Magistrate/ Sub-Divisional Magistrate/ Taluka Magistrate/ Executive Magistrate/ Extra Assistant Commissioner.
- (b) Chief Presidency Magistrate/ Additional Chief Presidency Magistrate/ Presidency Magistrate.
- (c) Revenue Officer not below the rank of Tehsildar.
- (d) Sub-Divisional Officer of the area where the candidate and/or his family normally resides.
- (e) Administrator/ Secretary to the Administrator/ Development Officer (Lakshadweep Islands).

#### **RESERVATIONS TO PHYSICALLY CHALLENGED (PC) CANDIDATES**

In total, 3% reservation (horizontal) shall apply for candidates with physical disability as per Govt. of India norms (minimum 40% disability; attested copy of the certificate from District CMO must be furnished). Such candidates must satisfy the eligibility requirements for admission. However, while considering these applications, only suitability for the programme is ensured and they are not compared with those belonging to other categories. The candidates called for counseling may also be examined by a Medical Board constituted by the Indian Institute of Technology (BHU).

## ADMISSION OF FOREIGN NATIONALS

Admissions to Ph.D. Programmes are available for Indian nationals residing abroad (INRA) and foreign nationals as per details given below.

1. Indian Nationals Residing Abroad (INRA): Candidates must have been residing abroad continuously for at least one year at the time of applying for admission. Their applications may be processed by the departments/schools as and when they are received or according to any schedule convenient to the departments/schools. The applications should be scrutinized to make sure that, in terms of qualifications, they are comparable with the candidates admitted in the general category.
2. The applications of foreign nationals, who are sponsored by the Indian Council of Cultural Relations (ICCR), will be scrutinized by the departments/schools concerned to assess their suitability for admission to the programme. The recommendations of the Department/School will be sent to the Chairman, Senate through the Chairperson, SPGC for approval.
3. Candidates belonging to the above two categories should satisfy the eligibility conditions and should have qualified GRE.

**N.B.: Mere fulfillment of eligibility criteria does not guarantee admission in a programme. The candidates' performance in the written test and interview should be at the levels expected for the respective programmes.**

## ACADEMIC REQUIREMENTS

The following Table lists the minimum residence and maximum duration allowed in the programme, and credit requirements for graduation in the various programmes:

*"Course Work" includes only postgraduate course credits as well as permitted undergraduate course credits (up to a maximum number of 2 courses of level 4), unless stated otherwise. To satisfy the "Minimum Residence" requirements, registration must be over consecutive semesters; exception will be made only if the student is on authorized leave. "Maximum Duration" is counted from the date of student's first registration. SPI/CPI will be calculated only on the basis of course work.*

Programme	Minimum Total Credits	Minimum Credits through Course Work	Minimum Credits through Thesis Work	Minimum Number of Courses <sup>1</sup>	Minimum Residence <sup>2</sup>	Maximum Duration
<b>1. Ph.D. in Engineering OR Ph.D. in Interdisciplinary programmes OR Ph.D. in Pharmacy OR Ph.D. in Sciences for students with</b>						
a) M.Tech. or M.Pharm. or IDD or IMD (or MBA together with B.Tech.) qualifications	220	44	110	4	4 Semesters	6 Years <sup>3</sup>
b) M.Sc. qualifications	275	66	110	6	5 Semesters	6 Years <sup>3</sup>
c) B.Tech. or B.Pharm. or 4-year B.S. qualifications	330	88	110	10	6 Semesters	7 Years
<b>2. Ph.D. in Humanistic Studies for students with</b>						
a) M.A. or M.Sc. qualifications	275	66	110	6	5 Semesters	6 Years <sup>3</sup>
b) 4-year programme in Engineering or Sciences	330	88	110	10	6 Semesters	7 Years

1. Students admitted to Ph.D. under External Registration category will be required to stay on the campus at least as long as it takes to (i) complete the required course work, (ii) pass the comprehensive examination, and to (iii) give the state-of-the-art seminar.
2. Students admitted to Ph.D. under External Registration category will be required to stay on the campus at least as long as it takes to (i) complete the required course work, (ii) pass the comprehensive examination, and to (iii) give the state-of-the-art seminar.
3. Add an additional year in case of part-time/external students.

## CORRESPONDENCE:

All queries concerning admissions should be addressed to the Head/Coordinator of Department/School concerned [Contact details given on admission portal].

**Table 1A : Departments/Schools/Disciplines and Allied Disciplines for Ph.D. Programmes.**

Most of the Bachelor's and Master's degrees that are being awarded in the disciplines in the country and abroad are listed in the following. However, a candidate possessing degree(s) that do not exactly conform to the degree(s) listed below may be considered for admission, based on the performance in written test / interview and provided that the interview / admission committee (DPGC), upon scrutiny of the list of courses done and credits earned by the candidate, finds that the degree concerned is at par with those listed below.

Departments/ Schools offering the Programme	Discipline	Allied Disciplines
Department of Ceramic Engineering	Ceramic Engineering	Bachelor's / Master's degree in any branch of Engineering. Master's degree in Chemistry/Applied Chemistry/Physics/ Applied Physics/Geology or Geophysics (with Mathematics as a subject at Bachelor's Degree level). Master's degree in Modern Medicine / Indian Medicine (for the areas related to Bioceramics). Preference would be given to candidates with B.Tech./M.Tech. in Ceramic Engineering/with some background of ceramics.
Department of Chemical Engineering & Technology	Chemical Engineering	Bachelor's/Master's degree in any branch of Engineering/Technology with Mathematics at Senior Secondary (Plus 2)/Intermediate level. Master's degree in Chemistry/Biochemistry/Environmental Science/ Biotechnology/Industrial Chemistry with Mathematics at Senior Secondary (Plus 2)/Intermediate level.
Department of Civil Engineering	Civil Engineering	M.Sc.(Engg.)/M.E./M.Tech. degree in Applied Mechanics, Mining Engineering, Chemical Engineering, Chemical Engineering and Technology, Chemical Technology, Agricultural Engineering. M.Sc.(Engg.)/M.E./M.Tech. in Geoinformatics, Geomatics, Remote Sensing, Remote Sensing and GIS. B.Sc.(Engg.)/B.E./B.Tech./ M.Sc.(Engg.)/M.E./M.Tech. in Computer Science and Engineering, Computer Engineering. B.Sc.(Engg.)/B.E./B.Tech./M.Sc.(Engg.)/ M.E./M.Tech. or equivalent degree in Environmental Engineering, Environmental Science and Engineering, Environmental Science and Technology. M.Sc./M.Tech. in Geophysics, Geology. M.Sc.(Engg.)/M.E./M.Tech. in Aerospace Engineering, Earthquake Engineering, Naval Architecture, Ocean Engineering, Mechanical Engineering. M.Tech./M.B.A. or equivalent degree in Construction Management, Operations Management, Environmental Management.
Department of	Computer	B.Tech./B.E./M.Tech./M.E. degree in Computer Technology/



<b>Departments/ Schools offering the Programme</b>	<b>Discipline</b>	<b>Allied Disciplines</b>
Computer Science & Engineering	Science & Engineering	Information Technology/ Electronics Engineering/ Electronics and Communication Engineering/All related subjects of Computer Engineering at M.Tech. level/ M.Tech. in Mathematics & Computing.
Department of Electrical Engineering	Electrical Engineering	B.Tech. & M.Tech. in Electronics Engineering.
Department of Electrical Engineering	Systems Engineering	Bachelor's and Master's Degree in any Branch of Engineering or Bachelor's Degree in any Branch of Engineering.
Department of Electronics Engineering	Electronics Engineering	Master's degree in any of the following areas: Digital Communication Systems, Information and Coding Theory, Telecom Networks, Mobile and Wireless Communication Systems, Digital Systems and Microprocessors, Digital Signal and Image Processing, Computer Vision and Robotics, Signal and Systems Theory, Control Systems, Fuzzy Logic, Neural Networks and their applications, Power Electronics, Microelectronics and VLSI Systems, Semiconductor Device Modelling and Simulation, Solid State Devices, Organic Electronics, Transparent Semiconductors and Photovoltaics, Sensors and Pattern Recognition, Electronic Instrumentation and Virtual Instrumentation, Electromagnetics, RF Engineering and Microwaves, Antennas, Optoelectronics and Optical Communication, Photonic Networks and Systems, Information Technology.
Department of Humanistic Studies	Humanities and Social Sciences	Master's/Bachelor's degree in any Engineering discipline; Master's degree in any Science discipline; 4-year – Bachelor's Science degree.
Department of Mechanical Engineering	Mechanical Engineering	Bachelor's degree in Production Engineering and Master's degree in any discipline/ area relevant to Mechanical Engineering.
Department of Mechanical Engineering	Industrial Management	Bachelor's degree in any branch of Engineering and Master's degree in any branch of Engineering/Management.
Department of Metallurgical Engineering	Metallurgical Engineering	Bachelor's / Master's degree in Mechanical / Chemical / Production Engg./Manufacturing Engg./Mineral Engg./ Ceramic Engg. Master's degree in Materials Science / Engg./ Technology Master's degree in Physical Sciences (Solid State Physics)/Chemical Sciences (Inorganic / Physical Chemistry/Industrial Chemistry)/ Biological Sciences/Geology with Mathematics as a subject at Bachelor's level.

<b>Departments/ Schools offering the Programme</b>	<b>Discipline</b>	<b>Allied Disciplines</b>
Department of Mining Engineering	Mining Engineering	<p>Master's degree in Geology/Geophysics/Geohydrology Mathematics/Petroleum Geosciences /Chemistry/ Environmental Science/Materials Science/Botany/ Zoology/Polymer Science/Computer Science</p> <p>Master's degree in Chemical Engg. / Environmental Engg. /Civil Engg./Industrial Engg./Mechanical Engg./Electrical Engg./Computer Engg./Electronics Engg./Polymer Engg. or Technology/ Ceramic Engg./Materials Engg./Information Technology</p>
Department of Pharmaceutics	Pharmacy	MS/M.Tech. in Pharmacy/Pharmaceutical Sciences/ Pharmaceutical Engineering/Pharmaceutical Technology/ Pharmaceutical Biotechnology/ Bioinformatics/ biochemical Engineering/ Biomedical Engineering with graduation in Pharmacy (B.Pharm.).
Department of Physics	Physics	M.Sc./M.Tech. in Applied Physics, Engineering Physics, Bio-Physics, Electronics Engg., Materials Science, Ceramic Engg., Metallurgical Engg., Electrical Engg., Bio-Informatics, Geomatics and Geoinformatics, Computer Science, Computer Engg., Mechanical Engg., Mathematics, Chemistry, Remote Sensing, Astrophysics, Space Physics, Applied Optics, Atmospheric Physics, Fibre Optics & Photonics.
Department of Chemistry	Chemistry	<p>Master's degree in Physics/ Biotechnology/ Biochemistry/ Medicinal Chemistry/ Environmental Science/ Materials Science and Technology/ Industrial Chemistry/ Applied Chemistry/ Nanotechnology with Chemistry as a subject at Bachelor's level.</p> <p>Bachelor's/Master's Degree of Engineering/Technology in Chemical/ Ceramics/ Metallurgical/ Pharmaceutics/ Materials Science and Technology as well as engineering disciplines related to chemical sciences.</p>
Department of Mathematical Sciences	Mathematical Sciences	<p>Master's degree in Statistics/ Computer Science/ Computer Engineering, with Mathematics as a subject at Bachelor's level.</p> <p>Bachelor's degree (B.Tech./B.E.) in Mathematics and Computing/ Computer Engineering/Computer Science.</p>
School of Biochemical Engineering	Biochemical Engineering	<p>Master's degree in Biochemistry / Biotechnology/Microbiology/ Environmental Science.</p> <p>Bachelor's/Master's Degree in Biochemical Engg./ Food Technology/Pharmacy/Chemical Engineering/Biotechnology</p>
School of Biomedical Engineering	Biomedical Engineering	<p>B.Tech./M.Tech. degree in Bioengineering/Electrical Engg./ Electronics Engg./Instrumentation Engg./MechanicalEngg./ Computer Engg./Materials Science &amp; Technology/ Chemical Engg./ Bio-technology.</p> <p>M.Sc. degree in Physics/Chemistry/Polymer Sciences/ Biochemistry.</p>
School of	Materials	Master's degree in Chemical Sciences, Materials Science and

<b>Departments/ Schools offering the Programme</b>	<b>Discipline</b>	<b>Allied Disciplines</b>
Materials Science & Technology	Science & Technology	Physical Sciences. Bachelor's / Master's degree in Ceramic/ Chemical/ Civil/ Electrical/ Electronics/ Mechanical / Metallurgical/ Polymer Engineering/ Plastic Technology/ Materials Technology/ Nanotechnology. Master's degree in Dentistry/ Orthopedics/ E.N.T./ Rasa Shastra.

**Table 1B : Discipline-wise Research Areas for Ph.D. Programmes.**

The discipline-wise the Research Areas in the Ph.D. programmes for the session 2016-17 are listed below.

Disciplines	Research Areas
Ceramic Engineering	Bio-Ceramics, Ceramic/Metal/Polymer matrix composites, Electro Ceramics, Glass and Glass Ceramics, Refractories, Advanced Ceramics, Nano Technology, Cement & Concrete Technology, Energy Materials.
Chemical Engineering	To be announced at the time of Interview
Civil Engineering	Structural Engineering; Hydraulics and Water Resources Engineering; Environmental Engineering; Geotechnical Engineering; Transportation Engineering; Geo-informatics; Gology.
Computer Science & Engineering	Social Network Analysis, HPC, Machine Vision, Natural Language Processing, Information Extraction, Data Mining, Image Processing, Pattern Recognition.
Electrical Engineering	Electrical machines & Drives; Power Electronics; Control Systems; Power Systems
Systems Engineering	Systems Engineering
Electronics Engineering	Microwave Engineering; Digital Techniques and Instrumentaion (Smart Sensor Networks)
Humanities and Social Sciences	Philosophy/ Sociology/ History/ English/ Computational Linguistics.
Mechanical Engineering	<p>a) <b>Machine Design:</b> Fracture behavior of fibre composite through thickness, Mechanical behavior of biocomposites; Composites, Impact and failure mechanisms, Computational Fracture Mechanics, Transient Dynamicss; Nuclear graphite and Fracture Characterization; Biomechanics, Cardiovascular stent design; Tiobology; Fracture Mechanics; Composite Materials such metal matrix composite, hybrid composite and nano composite for the mechanical and tribological applications; Fatigue wear modeling, contact modeling and its relevance to wear, Reliability of MEMS Devices.</p> <p>b) <b>Production Engg.:</b> Additive manufacturing, unconventional manufacturing, Incremental Forming &amp; Manufacturing, Metal firming, Manufacturing automation using: CAD/CAM/CAE/CE/Reverse Engg.; Tool wear condition monitoring; Materials aspect of Triobology, Composite Materials and Laser Surface Texturing; Weld metal characteristics, Thermal effects on weld metal properties, stress removal in casting.</p> <p>c) <b>Thermal and Fluid:</b> Thermal behavior of Fibre Comosite Materials; Solar Thermal, Alternate Fuel, Hybrid System; Engine Simulation; Multi-phase flows related to Molten Metal-Gas interaction, Hydro and Gas cyclones, Droplet/Bubble dynamics; Atomization – Pressure assisted, Electrohydrodynamic; Aerosol generation and measurement; Particle Image Velocimetry; Heat and Mass Transfer Analysis of Grains during fludized bed drying for achieving energy economy and higher quality; Influence of Climate Change for the Specification of Design Wind Speed</p>

<b>Disciplines</b>	<b>Research Areas</b>
	of Engineering Structure, Gasification based Polygeneration Cycle of Biomass for Hydrogen Production; Numerical and Experimental analysis of pulverized coal and biomass combustion.
Industrial Management	Operations Management, SCM, Production System
Metallurgical Engineering	Microstructural, Structural and Chemical Characterization; Mechanical Behavior, Deformation Processing and Failure Analysis; Phase Equilibria and Phase Transformation; Non-Equilibrium Processing of Advanced Materials; Ultra-Fine Grained and Nano-Structured Material; Metallurgical and E-Waste Utilization; Design and Development of Advanced Steels; Tribology and Surface Engineering' Thermodynamics and Kinetics of Metallurgical Processes' Advanced Structural and Functional Materials.
Mining Engineering	To be announced at the time of Interview
Pharmacy	Pharmaceutics, Pharmaceutical Chemistry, Pharmacology, Pharmacognosy.
Physics	Solar Physics, Space & Planetary Physics, Astrophysics, Condensed Matter Physics (Theory & Experiment), Biophysics, Fibre Optics, Photonics, Remote Sensing, Materials Science, Quantum Information, Renewable Energy.
Chemistry	Synthetic Chemistry, Environmental Chemistry, Surface Chemistry, Computational Chemistry.
Mathematical Sciences	Algebra, Analysis, Fuzzy sets and Applications (including Fuzzy Technology), Mechanics (Solid-, Fluid-, Bio-Mechanics), Mathematical Modeling and Simulation (Including queuing theory).
Biochemical Engineering	To be announced at the time of Interview
Biomedical Engineering	Physiology; Electrophysiology & Neuro Biology; Polymer in Medicine; Bioinstrumentation, Biomedical Signal & Image Processing; Modeling of Biological System, Biological Control System Analysis; Biomechanics; Tissue Engineering & Micro fluidics; Molecular Biology, Biochemistry, Biotechnology & Nano Medicine; Optical Nanomaterial, Biosensing, Image Theuranostics.
Materials Science & Technology	All core and allied subjects associate with Materials Science and Technology.

**Table 1C: Number of Seats Available for  
Ph.D. Programmes in Different Disciplines with Institute Assistantship**

Discipline	Number of Available Seats					
	General	OBC	SC	ST	PC	Total
Biochemical Engineering	3	1	---	---	---	4
Biomedical Engineering	---	---	---	---	---	---
Ceramic Engineering	5	3	1	1	---	10
Chemical Engineering	4	2	1	1	---	8
Chemistry	8	5	3	1	---	17
Civil Engineering	3	2	1	1	---	7
Computer Science & Engineering	4	1	1	1	---	7
Electrical Engineering	---	---	---	---	---	---
Electronics Engineering	9	4	2	1	---	16
Humanities & Social Sciences	1	1	1		---	3
Industrial Management	---	---	---	1	---	1
Materials Science & Technology	1	1	1	---	---	3
Mathematical Sciences	3	2	1	1	---	7
Mechanical Engineering	3	2	1	2	---	8
Metallurgical Engineering	5	2	1	1	---	9
Mining Engineering	7	---	---	---	---	7
Pharmacy	---	---	---	---	---	---
Physics	---	---	---	---	---	---
Systems Engineering	---	---	---	---	---	---

**Note:** The number of available TAs are not to be treated as number of available seats. Applicants who are either of sponsored category or who are already awarded fellowship by external agencies can submit their applications.

**LIST OF R & D ORGANIZATIONS RECOGNIZED BY THE INSTITUTE  
FOR EXTERNAL REGISTRATION**

1. All R & D Laboratories/Institutions of CSIR, DAE, DOS, DRDO, DST and Ministry of Telecommunication & Information Technology.
2. Bharat Heavy Electricals Limited (BHEL), Research and Development Laboratories.
3. Central Indian Pharmacopoeia Laboratory, Ghaziabad.
4. Central Mine Planning and Design Institute Limited, Ranchi.
5. Central Power Research Institute, Bangalore.
6. Central Pulp and Paper Research Institute, Saharanpur.
7. Diesel Locomotive Works (DLW), Varanasi
8. Hindustan Aeronautics Limited, Lucknow & Korwa.
9. Hindustan Machine Tools (R & D Division), Bangalore.
10. Indian Bureau of Mines, Nagpur.
11. Jyoti Limited, Baroda.
12. Kirloskar Electric Limited, Bangalore.
13. Mechanical Engineering Research and Development Organization, Pune.
14. National Institute of Rock Mechanics, Kolar.
15. National Council for Cement and Building Materials (NCCBM), New Delhi.
16. Raman Research Institute, Bangalore.
17. Tata Steel, Jamshedpur.
18. National Metallurgical Laboratory Extension Centre, Chennai.