

# **INFORMATION BROCHURE**

**(Semester II, 2017-2018)**

**for admission to**

**Ph. D. and MS(R) Programmes**



**INDIAN INSTITUTE OF TECHNOLOGY DELHI**

**HAUZ KHAS, NEW DELHI 110016**

## CONTENTS

Message to the Applicants from the Dean, Academics	3
Important Dates	5
Introduction	6
Credit System	7
Admission Procedures and Requirements	7
(I) Ph. D. Programmes	7
(II) M. S. (Research) Programmes	11
Reservation of seats	14
Registration for courses	14
Hostel accommodation	14
Fees and payments	15
(a) Institute dues payable by new students of Ph. D./M.S.(R)	15
(b) Mess dues payable by new students	15
Financial assistance and other support	16
General guidelines	18
Application procedure	19
Refund of fees	19
Important instructions for filling application form	19
Contact telephone/FAX nos.	20
Annexure-I Research Programmes: Doctor of Philosophy (Ph.D.)	21
Annexure -II M.S. (Research) Programme offered	30
Additional Important Information for Candidates	31

## **Message to the Applicants from the Dean, Academics**

I am very happy to note that you are planning to pursue your postgraduate education, and particularly that you are considering IIT Delhi as one of your choices. India is fast emerging as a knowledge economy and in the next decade or so, would emerge as a major centre for research and technology development. In this context, your decision to pursue post-graduate education would definitely have a significant impact on your long-term career prospects. IIT Delhi with its 37 M. Tech., 26 Ph.D., 10 M.S. (R), 3 M. Sc, 3 MBA, and one M. Des. Programmes, offer you extensive choices of specialization. The strength of the Institute is its 450+ highly qualified faculty, due to which it is continuously ranked among the top 50 technical institutions globally.

In the last few years, we have constantly been working towards making our rules, regulations, and policies governing postgraduate education flexible and attractive to potential candidates. I am writing this letter to make you aware of some major policy changes in the last couple of years.

1. At IIT Delhi, most of the academic Departments/Centres/Schools offer M. Tech. and Ph.D. programmes while some of them also offer an M.S. (R) programme. Major policy changes now permit the student to switch from one programme to another any time after one semester of joining. For example, a candidate joining an M. Tech. programme can apply for the switch to a Ph. D. programme in the same Department (or even in another eligible Department), after completing 12 credits of courses with a minimum GPA of 8.0. All his/her credits, if relevant to the new programme, can be transferred and thus make his/her transfer to the new programme as a student with advanced standing. Similar, flexibility exists for switching between other programmes.
2. In the last year, IIT Delhi has initiated sponsored research activity worth more than Rs.130 crores which is expected to grow further this year. Candidates wanting to gain project experience along with post-graduate education can apply and join one of the sponsored projects simultaneously with admission to the postgraduate degree. Apart from gaining experience, various schemes may provide for much higher assistantship amounts with your participation in the sponsored research projects. One significant policy change that has been adopted is that the recruitment for the project can also be carried out by the same Department/ Center/ School Research Committee (DRC/CRC/SRC) that admits students to the post-graduate programmes.
3. IIT Delhi is striving towards ensuring each of its Ph.D. students and a good number of postgraduate students have an opportunity to present a paper and attend at least one international conference before they graduate. A number of initiatives taken in the last couple of years have yielded significant results. Visit <http://www.iitd.ac.in> for other details.
4. Our post-graduate programmes are highly flexible which offers students a variety of courses and research topics to choose from.
5. Meritorious students with a bachelor's degree (such as B. Tech.) are advised to directly apply for the Ph.D. programmes if they wish to pursue doctoral research. Details about direct admission to Ph. D. for B.Tech-qualified students are available in this brochure and also on our website. Of course, students who already hold a master's degree are welcome to apply for Ph. D.
6. IIT Delhi is actively promoting post-graduate research in inter-disciplinary areas, and you are invited to avail of this exciting opportunity. Please look for more details on inter-disciplinary research on our website.

You may wish to note that IIT Delhi has a larger number of students in post-graduate programmes than in undergraduate programmes. All students are equally important to us, but increasingly the Institute's focus is more towards the research and innovation undertaken by our post-graduate students. We urge you to consider us as your institution of choice to further your goals of getting a higher professional degree.

There are many more things I would like to share with you upon your joining IIT Delhi. I am looking forward to seeing you in the Orientation Programme during 01 January 2018 with you being accepted for admission in one of your preferred postgraduate programmes.

With best wishes,

Prof. Bhim Singh  
Dean, Academics

## **Important Dates**

Submission of online application commences on	October 14, 2017 (12.00 noon)
Last date for submission of online application and application fee	October 30, 2017 (04.00 pm)
Range of dates for Test / Interview	December 04, 2017 - December 15, 2017
Date of Orientation and Registration for new students	January 01, 2018
Commencement of classes	January 02, 2018

## **INTRODUCTION**

Indian Institute of Technology Delhi is one of the seven older established Institutes of Technology in India, the others being Kharagpur, Bombay, Madras, Kanpur, Guwahati, and Roorkee. Recently, Government has set up sixteen more Institutes of Technology. These Institutes have been created as centres of excellence for higher training, research and development in science, engineering, and technology. Established as a College of Engineering in 1961, the Institute in Delhi was declared an Institute of National Importance under the “Institutes of Technology (Amendment) Act, 1963” and renamed “Indian Institute of Technology Delhi”. It was then accorded the status of a University with powers to decide its own academic policy, to conduct its own examinations, and to award its own degrees.

The Institute offers undergraduate and postgraduate programmes through its Departments, Centres, and Schools. The Institute admits about 850 students for the undergraduate (B.Tech) programmes and about 1400 students for the postgraduate (M. Sc. / M. Tech. / M. S. (Research) / M. Des. / M. B. A. / Ph. D.) programmes every year.

Intellectual alertness, creativity, and talent for innovation go into the making of an engineering leader today and continue to be essential for professional competence tomorrow. The candidates selected for admission live in pleasant surroundings of intellectually stimulating campus, use the most modern equipment and laboratory facilities available, and go through the specialized courses designed to meet the challenges of the future. The teaching methods rely on direct personal contact between the teachers and the students. Living in such an environment with people having similar goals and aspirations is an exciting experience during one’s academic life and is of considerable value in one’s professional career.

**Location:** IIT Delhi is situated at Hauz Khas in South Delhi, bounded by the Sri Aurobindo Marg on the East, the Jawaharlal Nehru University complex on the West, the National Council of Educational Research & Training on the South, and the Outer Ring Road to the North. The Institute campus is about 19 km away from the Delhi Main Railway Station, 14 km from the New Delhi Railway Station, 21 km from the Maharana Pratap Inter-State Bus Terminus (Kashmere Gate), 22 km from Indira Gandhi International Airport Terminal 3, and about 10 km from the domestic terminal (Terminal 1) of the Delhi Airport. The nearest Metro Station is Hauz Khas at a distance of about 1 km.

**Campus:** IIT Delhi is a residential Institution and provides residential facilities to the majority of students as well as the teaching staff, as per availability. The Institute campus area extends to 320 acres with many interesting topographical features, imaginatively laid out with picturesque landscape, numerous buildings, and wide roads. The campus presents a spectacle of harmony in architecture and natural beauty.

The main academic building houses various teaching, research, and library facilities. Though each Department/ Centre/ School is a separate entity, all the Departments/Centres/Schools together constitute an integrated complex. Lecture theaters with modern amenities and equipment for projection have been located adjacent to two or more Departments for common use. The campus also provides such amenities as staff clubs, hospital, shopping centres, banks, ATMs, post office, community centre, stadium and playing fields.

The Students Activities Centre provides all facilities for students’ extracurricular and physical development. The central two-storeyed block with a swimming pool and a gymnasium hall has amenities such as squash courts, hobbies workshop, seminar rooms, music rooms and other multipurpose rooms for reading and indoor games. The amphitheater constructed in modern style is an added amenity at the centre.

## **CREDIT SYSTEM**

Education at the Institute is organized around the credit system of study. The prominent features of the credit system are a process of continuous evaluation of a student's performance, and flexibility to allow a student to progress at an optimum pace suited to his/her ability or convenience subject to fulfilling minimum requirement for continuation.

Each course has a certain number of credits which describe its weight. A student's performance in course is assessed by a grade awarded to him/her at the end of the semester for that specific course, based on comprehensive evaluations during the entire duration of the course. The student's overall progress through the programme is measured by the number of credits that he/she has completed satisfactorily. A minimum Grade Point Average (average score based on grades obtained, weighted by the corresponding credits of each course), is required to be maintained for satisfactory progress.

The minimum academic requirements for the various degrees, including minimum and maximum credits to be registered in a particular semester, are indicated in the Course of Study for the year 2017-2018, which will be made available on the Institute Website before the date of Orientation.

Every course is coordinated by a member of the teaching staff of the Department/ Centre/ School which offers the course in a given semester. This Faculty member is called the Course Coordinator. He/she has full responsibility for conducting the course, coordinating the work of the other members of the faculty involved in that course, and for holding tests and assignments and awarding grades. For any difficulty, a student is expected to approach the Course Co-coordinator for advice and clarification.

## **ADMISSION PROCEDURES AND REQUIREMENTS**

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

The award of the Ph.D. degree is in recognition of high achievements, independent research, and application of scientific knowledge to the solution of technical and scientific problems. The creative and productive inquiry is the basic concept underlying the research work. The details of research programmes in various Departments/ Centres/ Schools are given in **Annexure-I**.

**Coursework and other academic requirements:** In order to overcome any deficiency in the breadth of fundamental training or proper foundation for advanced research work, special make-up or pre-doctoral courses are offered by each Department/ Centre/ School. These courses are given either by a faculty member or by guest speakers and specialists in the profession. Normally, candidates having a B. Tech./ M.Sc./ M.A., or equivalent degree are required to complete a minimum of 12\* credits with a minimum required GPA of 7.5. M. Tech. or equivalent degree holders are required to complete a minimum of 6\* credits with a minimum required GPA of 7.5.

**Admission to the Ph.D. Programmes:** Admission to the Ph.D. programmes is normally made on the basis of an interview of eligible candidates conducted by the Department/Centre/School concerned through its Department Research Committee (DRC) / Centre Research Committee (CRC)/ School Research Committee (SRC). DRC/CRC/SRC may decide to conduct a written test as well to screen the candidates. Applications are invited from candidates by advertising the programmes in Employment News/leading newspapers in March for the first semester and in October for the second semester every year.

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*\*A Department/ Centre/ School may specify a higher credit requirement for all their Ph.D. programmes. It may also require an individual scholar to complete a larger number of credits based on his/her background and preparation level.*

**Admission schedule:** Normally, Ph.D. programmes are advertised in the month of March and October each year in the Employment News as well as in leading newspapers, and admissions are carried out in the months of May and December. Further, admission to the Ph.D. programme is possible **any time of the year** with the application being processed and candidates interviewed by the respective DRC/CRC/SRC. Ph.D. scholars can join the Institute at any time of the year, though the course registration will be possible only at the beginning of the subsequent semester. Such candidates must also fulfill the required academic qualification/ experience at the time of interview. They must join the Institute within 4 weeks after the issue of admission offer unless specifically permitted otherwise. Admission is subject to the vacancy being available in the relevant specializations.

**Duration of the programmes:** Minimum period of registration required for students with M.Tech. or equivalent qualifications is 2 years whereas those with B. Tech. or equivalent qualifications is 3 years. All candidates are allowed a maximum of 7 years for submission of their theses.

#### **I(a) Minimum Qualifications for admission to Full-time Ph. D. Programmes:**

Table-1 defines the minimum qualifications required for admission to full-time Ph. D. programmes at IIT Delhi for *General/OBC (Non-creamy Layer)* category students. Please note:

- These are Institute minimum requirements and any Department/Centre/School operating through their DRC/CRC/SRC can specify higher short-listing criteria than what is specified here.
- This table includes most of the degrees, but each DRC/CRC/SRC is free to specify the qualifications and disciplines acceptable for admission to their programmes.
- Candidates in the final year of their programmes and who expect to complete all their qualifying degree requirements before the date of registration are also eligible to apply for admissions. For short-listing purposes, their performance until the preceding semester (preceding year if their programmes are year based) would be considered but their admission would be provisional, subject to their meeting the minimum eligibility criteria after their final qualifying examination results are announced.

**Table 1: Minimum Qualification for Admission to full-time Ph.D. Programmes**

Qualifying Degree	Minimum performance in Qualifying degree for General/OBC (Non-Creamy Layer) category students	Qualification through national level examination requirements
M. Tech./M.E./M.D. / or equivalent	60% marks or 6.00 CGPA on a 10-point scale	Nil
M.Sc./MBA/M.A./ M.B.B.S. or equivalent	60% marks or 6.00 CGPA on a 10-point scale	Qualified GATE/  CSIR/UGC NET/ICAR/ICMR/DST-INSPIRE fellowship
B.E./B. Tech. or equivalent	70% marks or 7.00 CGPA on a 10-point scale	Qualified GATE/CSIR/UGC NET/ICAR/DST INSPIRE Fellowship

**Exemptions, relaxations and clarifications:**

1. For *SC/ST/PH category students*, minimum performance in the qualifying degree with postgraduate qualifications (first two rows in Table 1) is relaxed from 60% to 55% (6.00 to 5.50)
2. Qualifying degree performance is computed by *aggregating performance over all the semesters/years* of the qualifying degree.
3. In respect of M.A., M.Sc. and/or *B. Tech. from IITs* graduating with a CGPA of 8.0 or above, the requirement of qualification through a national examination (row three in Table 1), is waived off.
4. Students from CFTIs (Centrally Funded Technical Institutions (IITs, NITs, IIITs, etc)) having CPI/ CGPA 7.00 (on a 10.00 scale) at the end of the 3<sup>rd</sup> year are also eligible for admission to Ph.D. The requirement of qualification through a national examination (row three in Table 1) is waived off.
5. For purposes of shortlisting, the *primary method of evaluation* (i.e., CGPA/CPI, or aggregate percentage) followed by the institution where the candidate has obtained his/her qualifying degree will be used by IIT Delhi for determining whether the candidate meets the final shortlisting requirements.
6. For assistantship purpose only, candidates with *M.B.B.S. qualification* will be considered equivalent to M. Tech.

7. For candidates with M.A. degree in English, a 5% relaxation in marks or 0.5 relaxation in CGPA may be permitted for admission to the Ph.D. programme in Humanities and Social Sciences.
8. Candidates holding MBA degree are eligible for applying to the Ph.D. programme in the Department of Management Studies.

**I (b) Minimum Qualifications for admission to Part-time and Sponsored (full-time) Ph.D. Programmes:**

The following eligibility conditions apply for the Part-time and sponsored full-time programmes:

1. Only employees of Public Sector Undertakings or Government Departments or Research and Development Organizations or Private Industries (approved by Faculty Boards) are eligible for admission to these programmes.
2. The minimum full-time experience required *after* obtaining the qualifying degree and as on date of registration is given in below in Table 2:

**Table 2: Experience required for admission to part-time Ph.D./ M.S.(R) Programmes**

<b>For admission to part-time programme</b>	<b>Qualifications</b>	<b>Work Experience (Post Qualification)</b>
Ph.D.	M.E./M.Tech./M.S.(R)/M.D.or Equivalent	Nil
Ph.D.	B.E./B.Tech./M.Sc./M.A./M.B.A./MBBS or equivalent, from CFTIs/Central Universities	1 Year
Ph.D.	B.E./B.Tech./M.Sc./M.A./M.B.A./MBBS or equivalent, and working in IIT Delhi* (Project or Regular) *Through proper channel	1 Year
Ph.D.	B.E./B.Tech./M.Sc./M.A./MBA/MBBS or equivalent, from institutions other than CFTIs/Central Universities	2 Years
MS(R)	B.E./B.Tech./M.Sc or equivalent, from CFTIs/Central Universities	6 Months
MS(R)	B.E./B.Tech./M.Sc or equivalent, and working in IIT Delhi* (Project or Regular) * Through proper channel	6 Months
MS (R)	B.E./B. Tech./M.Sc. or equivalent, from institutions other than CFTIs/ Central Universities)	1 Year

3. Minimum qualification for these candidates is the same as for full-time candidates, except that the requirement of qualifying in a national examination (column 3 in Table 1) is waived off.

4. For part-time candidates from outside NCR (or at a radial distance of more than 50 km from IIT Delhi), there is a minimum residency requirement of 6 months. DRC/CRC/SRC may specify a higher residency requirement based on the courses recommended as well as the background.
5. **Sponsored (full-time) candidates** seeking admission to a Ph.D. programme on the basis of study leave, must submit a “Sponsorship Certificate” on a proper letterhead from the appropriate authority in the organization clearly stating the following:
  - for the period of his/her studies in the programme, the candidate would be treated as on duty with usual salary and allowances; and
  - that he/she will be fully relieved and granted study leave for a minimum period of 3 years (2 years for M. Tech. and equivalent degree holders).
6. **Part-time candidates** are required to submit a “No Objection Certificate” (NOC) on a proper letterhead from the appropriate authority in the organization clearly stating the following:
  - the candidate is permitted to pursue studies on a part-time basis;
  - that his/her official duties permit him/her to devote sufficient time for research;
  - facilities for research in the candidate’s field of research are available at the candidate’s place of work, in case the proposed Ph. D. research plan requires him/her to use these facilities when the candidate is physically present at this place of work; and
  - he/she will be fully relieved from duty and permitted to reside at the Institute for the period of required residency (This is not a requirement for candidates who are working in NCR or organizations located within a distance of 50 km from the Institute).

The template of this NOC is available on the IIT Delhi PG admissions website. Kindly note that lack of confirmation and clarity on one or more of the above points in the NOC may make prevent the applicant’s application being processed, even if he/she qualifies in the interview/screening.

## II. M. S. (Research) Programme

The Institute M.S. (Research) programme offered by following Departments and Centres. M.S.(R) programmes have two-thirds of the credits for the thesis component :

S. No.	Department/Centre/School/Interdisciplinary Programme	Code
1.	Applied Mechanics Department	AMY
2.	Amar Nath and Shashi Khosla School of Information Technology	SIY
3.	Bharti School of Telecommunication Technology and Management	BSY
4.	Chemical Engineering	CHY
5.	Civil Engineering	CEY
6.	Computer Science & Engineering	CSY
7.	Electrical Engineering	EEY
8.	Mechanical Engineering	MEY
9.	School of Biological Sciences	BLY

Admission to M.S. (Research) Programme in Computer Science & Engineering Department (CSY) is limited to candidates who have a Qualifying degree in Computer Science, Electrical Engineering, Information Technology, M.Sc. Operations Research, Electronics and Communication, M.Sc. Statistics, MA/M.Sc. Math, M.Sc. Math (with exposure to an appropriate level course in Computer Technology) and MCA (with Math and Science at B.Sc. level).

In addition to the above, both the programmes (MCS and CSY) are limited to candidates who have appeared in GATE with Computer Science and Engineering or Information Technology.

The minimum duration of M.S.(Research) Programme is 4 semesters (24 months) for full-time students and 6 semesters (36 months) for part-time students.

**Flexibility of movement:** IIT Delhi has recently adopted major changes in its rules and regulations to enable easy mobility of students from MS(R) to M.Tech. and MS(R) to Ph.D. With these changes, it is now possible for a student to join /MS (R) at IIT Delhi and then apply for a change to the Ph.D. programme if he/she feel confident. In this process, he/she can save a considerable amount of time to complete Ph.D.

Further, just like Ph.D. admission, admission to MS(R) programmes is also possible at **any time in the year** through DRC/CRC/SRC. The student can be admitted to the institute at any time of the year, though the course registration in such cases will be possible only at the beginning of the subsequent semester. Such candidates must also fulfill the required academic qualifications /experience at the time of interview. They must join the institute within 4 weeks after the issue of admission offer unless specifically permitted otherwise. Admission is subject to the vacancy being available in the relevant specializations.

**Part-Time programmes:** IIT Delhi also offers most of its MS(R) programmes in the part-time mode for working professionals. They are expected to complete their credit requirements in six semesters (maximum of ten semesters) by registering for a lower load than full-time students in each semester. Departments /Centres/Schools offer most of the core courses between 8:00 AM to 10:00 AM to enable these working professionals to attend classes as well as continue with their full-time employment.

Please note that it may not always be feasible to slot all courses of the programme in the morning and those candidates applying for part-time programmes should be flexible to take courses at other times if required.

## **II(a) Minimum qualifications and procedure for admission to Full-time M.S.(R) Programme:**

Table 3 lists the minimum qualifications required for admission to full-time M.S.(R) programme at IIT Delhi for **General/OBC (Non-creamy Layer)** category students. In this context, please note:

- These are Institute minimum requirements and any Department/Centre/School operating through their DRC/CRC/SRC/PEC can specify higher short-listing criteria than what is specified here.
- This table includes many degrees for eligibility, but each DRC/CRC/SRC/PEC is free to specify the qualifying degree disciplines as well as GATE disciplines acceptable for admission to their programmes.
  - Admission to M. S.(R) programme is carried out by first short-listing the eligible candidates (meeting the minimum performance in their qualifying degree - Column 3 of Table 2), and scoring above a GATE cut off specified for that programme and then conducting written test/interview at IIT Delhi. In such cases, GATE score is given a minimum weight of 70% in judging the overall performance of the candidates appearing for the interview.
- DRC/CRC/SRC/PEC is empowered to offer direct admission for M.S.(R) programme without interview to exceptionally meritorious students. The minimum performance required by such candidates is also listed in Table 3. This is the Institute minimum, and the DRC/CRC/SRC/PEC is free to set higher eligibility criteria for direct admissions without an interview. DRC/CRC/SRC/PEC may also decide not to offer any direct admissions without interviews.
- Candidates in the final year of their programmes and who expect to complete all their qualifying degree requirements before the date of registration are eligible to apply for admission. For shortlisting purposes, their performance till the preceding semester (preceding year if their programme is year based) would be considered, but their admission would be provisional, subject to their meeting the minimum eligibility criteria after their final qualifying examination results are announced.

**Table 3: Minimum Qualification for Admission to full-time M.S.(R). Programme**

<b>Programme &amp; Admission type</b>	<b>Qualifying Degree</b>	<b>Minimum performance in the qualifying degree for General/OBC (Non-Creamy Layer) category students</b>	<b>National level examination Requirements</b>
M.S.(R) (Direct Admission without test /interview)	B.E./B. Tech./ M.Sc. or equivalent	75% marks or 7.5 CGPA on a 10-point scale	Qualifying Gate Score
M.S.(R) (Admission with test/interview)	B.E./B. Tech./ M.Sc. or equivalent	60% marks or 6.00 CGPA on a 10- point scale	Qualifying Gate Score

**Exemptions, relaxations and clarifications:**

1. For Direct admission of *SC/ST/PH category students* (Table 3), minimum performance in the qualifying degree is relaxed from 75% to 70% (7.5 to 7.0)
2. For admission with interview of *SC/ST/PH category students* (Table 3), minimum performance in the qualifying degree is relaxed from 60% to 55% (6.00 to 5.5).
3. Qualifying degree performance is computed by *aggregating performance over all the semesters/years* of the qualifying degree.
4. For all *B.Tech. from IITs* graduating with a CGPA of 8.0 or above, the requirement of qualification through GATE is waived off.
5. Candidates with AMIE or Grad. IETE qualifications may also be considered for admission to the M. Tech. Programmes; however, if provisionally selected for admission based on their AMIE/Grad IETE performance, they would be required to complete 24 valid undergraduate credits prescribed by the concerned DRC/CRC/ SRC/PEC and clear the GATE examination before being actually admitted to the M.S.(R) Programme.

**II(b) Minimum Qualifications for admission to Part-time and Sponsored (full-time) M.S.(R) Programme:**

The following additional eligibility conditions and relaxations apply for the Part-time and sponsored full-time programmes.

1. Only employees of Public Sector Undertakings or Government Departments or Research and Development Organizations or Private Industries (approved by Faculty Boards) are eligible for admission to these programmes.
2. Employees of only those organizations which are located within 50 Kilometers radius of IIT Delhi are eligible to be considered for admission to part-time M.S.(R) programme
3. The minimum experience (Full Time) required after qualifying degree and as on date of registration is as given in Table 2 above
4. Minimum qualification for these candidates is the same as for full-time candidates except that the requirement of qualifying in a national examination (column 4 in Table 3) is waived off.
5. *Sponsored (full-time) candidates* seeking admission to a M.S.(R) programme on the basis of study leave, must submit a “Sponsorship certificate” on a proper letterhead from the appropriate authority in the organization clearly stating the following:

- a. for the period of his/her studies in the programme, the candidate would be treated as on duty with usual salary and allowances, and
  - b. that he/she will be fully relieved and granted study leave for a minimum period of 2 years
6. **Part-time candidates** are required to submit a “No Objection Certificate” on a proper letterhead from the appropriate authority in the organization clearly stating the following:
- the candidate is permitted to pursue studies on a part-time basis
  - that his/her official duties permit him/her to devote sufficient time for studies
  - that he/she will not be transferred to any other place during the period of study

### **RESERVATION OF SEATS**

- (a) 15% seats are reserved for SC and 7.5% for ST candidates.
- (b) 27% seats are reserved for Non-Creamy layer OBC candidates. All candidates applying for admission under this category should produce the OBC (Non-Creamy Layer) Certificate applicable for OBCs in the Central list at the time of interview. For details and specimen form visit: <http://www.iitd.ac.in>.
- (c) 5% seats in the respective categories are reserved for the physically handicapped persons in the Postgraduate courses and Ph.D. Programmes.

**Note:** *All shortlisted candidates applying for admission under the reserved categories are required to produce the relevant certificate at the time of interview.*

### **REGISTRATION FOR COURSES**

All students are required to report for Orientation and Central Registration before the commencement of each semester according to the schedule/procedure notified in advance. The students register themselves for the courses in consultation with the Course Coordinator. The courses to be run by the Departments are made known to the students before registration. On admission, the students should go through carefully the Departmental advice of courses for their discipline. They should also go through the **Prospectus** regarding the rules governing their academic duties and performance. In some Departments, the required performance levels for the continuation of registration may be higher than those given in the Prospectus. The admitted students must acquire a copy of the departmental norms in such cases.

### **HOSTEL ACCOMMODATION**

All post-graduate students admitted on a full-time basis can, subject to availability, avail of residential facilities in the hostels. The Institute has eleven boys' hostels, two girls' hostels and a hostel for married students. For married students, only a limited accommodation is available. Each hostel, except Married Research Scholar accommodation, is self-contained with amenities such as a reading room, an indoor games room, a lounge and a dining hall with mess. Hostel rooms are adequately furnished. The hostel for married students has one/two-room suite(s) with an attached bath and a kitchen for each resident family.

***It may be noted that at present there is a shortage of hostel accommodation owing to renovation activities and increase in student strength, and the Institute may not be in a position to offer hostel accommodation to all post-graduate students. In such a case, Institute will try to facilitate students to get accommodation outside the campus.***

## FEES AND PAYMENTS

### (a) INSTITUTE DUES PAYABLE BY 2017 ENTRY PH.D./M.S.(R) STUDENTS

**Table 4: Schedule of fee applicable for different programmes in January 2018 admission.**

<b>MS(R) Students Receiving Institute/Project Assistantship or Teaching positions holders</b>	
General/OBC	20500
SC/ST/PH	15500
<b>MS(R) Students (Sponsored, FT, PT and Non Teaching position holders)</b>	
General/OBC	40500*
SC/ST/PH	15500
<b>All Full-Time Ph.D. Students</b>	
General/OBC	18000
SC/ST/PH	15500
<b>All Part-Time Ph.D. Students</b>	
General/OBC	12100
SC/ST/PH	9600

**Note:**

- SC/ST/PH students are given 100% exemption from payment of tuition fee.
- Non-Hostelers/ Part Time Sponsored students need not pay the Hostel Seat Rent of Rs. 5300\*.
- The exact amount of fees and mode of payment will be indicated in the offer of admission.
- \* Fee may be revised

### (b) MESS DUES PAYABLE BY 2017 ENTRY STUDENTS

Membership of associated mess is compulsory *only for those allotted Hostel accommodation*. They will be required to pay Mess Dues at the time of joining as detailed in Table 5.

**Table 5: Mess Dues applicable at the time of joining the Mess for January 2018 admissions**

Details	Boys	Girls
Mess Security Deposit (Refundable)	Rs. 10,000	Rs. 10,000
Mess Admission (one time payment)(Non refundable)	Rs. 3,500	Rs. 3,500
Mess Advance (one-time payment adjustable against	Rs. 16,500	Rs. 15,500
<b>Total</b>	Rs.30,000	Rs.29,000

## FINANCIAL ASSISTANCE AND OTHER SUPPORT

### I. Ph.D. Programme

A scheme for the award of Teaching/Research Assistantship for providing financial assistance to the students exists. In terms of this scheme, those non-sponsored students who are admitted on a full-time basis are considered for the award of Half Time Teaching/Research Assistantship. These rates have been significantly enhanced by the MHRD recently and are as indicated below:

**Table 6: Assistantship amounts for Full-time Institute Ph.D. students**

Period of assistantship	Assistantship amount		Hours/week assistance to be provided
	With B.Tech/B.E./M.Sc. or equivalent qualifications	With M.Tech./M.E./M BBS or equivalent Qualifications	
First 2 years of Registration	Rs. 25,000/- p.m.	Rs.25,000/- p.m.	8
Next 3 years of Registration	Rs.28,000/- p.m.	Rs. 28,000/- p.m.	8

**Other conditions and benefits:** In addition, the full-time students enjoy a number of benefits but are also required to satisfy academic performance requirements for continuation of assistantship from semester to semester.

- The maximum duration for which assistantship can be awarded to a Ph.D. student is 5 years.
- In the first instance, the assistantship is awarded for one semester. Continuation of the assistantship during the subsequent semesters is contingent upon satisfactory academic performance and satisfactory performance in the discharge of responsibilities assigned under the assistantship scheme. For this purpose, a SGPA of 7.00 at the end of a semester in respect of those semesters when the student has been assigned course work will be considered as satisfactory performance. For details of SGPA calculation refer to the Institute Prospectus.
- All fulltime students participating in a sponsored project/consultancy project (in addition to their assistantship work) can be paid an honorarium of up to Rs. 10,000/- p.m. by the PI/CI of the project. All such work can be undertaken only with the consent of their supervisor(s).
- The faculty of an Engineering/Science College sponsored by his/her institution for pursuing Ph.D. at IIT Delhi and meeting all the academic requirements of full-time Institute assistantship can be considered by the DRC/CRC/SRC/PEC for the award of Institute Assistantship. This assistantship would be over, and above the emoluments, he/she may be getting from his/her parent institution.
- Apart from Institute assistantship, IIT Delhi has a number of assistantships sponsored by national as well as international institutions and/or industries. All students including faculty of engineering/science colleges meeting the academic qualifications for admission as full-time students with Institute assistantship are also entitled to apply for these. For more information on the availability of such scholarships in your area, please contact your respective department/centre/school.
- In exceptional cases with the approval of the Chairman, Senate, Sponsored (Fulltime) candidates employed in CSIR/DRDO/PSUs may also be offered assistantship provided they have qualified either GATE or any other national level examination like CSIR/UGC NET/ICAR etc. and fulfill the requirement for award of assistantship and their employer has no objection to the same.

- Institute provides seed money of Rs. 20,000/- once during the program as partial financial assistance for presenting papers abroad in good academic conferences
- Institute is in the process of formalizing a number of agreements with leading foreign institutions or agencies for supporting upto 6 months long research visits by Ph.D. students. This would enable interested students with the consent of their supervisor and DRC/CRC/SRC to undertake a research visit which would increase his/her exposure while adding value to his/her work.
- It is expected that all assistantship holders will have good general physique. He/She will have to produce on the date of Central Registration, a certificate to that effect in the prescribed format. A copy of the format would be given along with the admission offer letter. The admission is subject to his/her being found medically fit.

## **II M.S. (R) STUDENTS**

A scheme for the award of Teaching/Research Assistantship for providing financial assistance to the students exists. The present scheme is described below:

- Students admitted to M.S. (Research) on a full-time basis are considered for the award of Teaching Assistantship under which they will be paid Rs.12,400/- per month and would be required to provide assistance of 8 hours/week to the Department/Centre/School.
- The maximum duration for which Assistantship can be awarded to M.S.(R) students is 4 semesters.
- Only full-time non-sponsored students who have qualified GATE are eligible for an assistantship.
- In the first instance, the assistantship is awarded only for one semester. Thereafter continuation of the assistantship during each semester is contingent upon satisfactory academic performance and satisfactory performance in the discharge of responsibilities assigned under the assistantship scheme. For this purpose, an SGPA of not less than 7.00 (6.00 in the case of SC/ST/PH) at the end of the semester is treated as a satisfactory academic performance.
- All full-time M.S.(R) students participating in a sponsored project/ consultancy project (in addition to their assistantship work) can be paid an honorarium of up to Rs. 3,000/- p.m. by the PI/CI of the project. All such work can be undertaken only with the consent of their supervisor(s).
- Candidates qualified for CSIR JRF will not be allowed to avail fellowship for doing M.S.(R) programme. However, they can avail the CSIR fellowship for doing the Ph.D. programme.
- Apart from the above-mentioned scheme for teaching/research assistantships, there are a number of fellowships/scholarships instituted by Industries/Individuals. (For more information on these scholarships/ assistantships/fellowships please contact the respective department).
- A number of DAAD scholarships under the Sandwich System may be available. Indian Students pursuing M.S. (R) at IIT Delhi are eligible for this scholarship for doing their thesis work for about 6 months at one of the nine German Technical Universities (TU9).

- Institute is pursuing a number of other collaborative agreements with leading research laboratories universities to enable such research visits by post-graduate students
- It is expected that all assistantship holders will have good general physique. He/She will have to produce on the date of Central Registration, a certificate to that effect in the prescribed format. A copy of the format would be given along with the admission offer letter. The admission is subject to his/her being found medically fit.

## GENERAL GUIDELINES

- (a) The minimum eligibility criteria indicated above for each programme is only an enabling clause. The Deptt./Centre/School may fix higher criteria at the time of shortlisting keeping in view the number of candidates, minimum background expected to cope with the programme etc.
- (b) The minimum prescribed 60% marks in aggregate (of all the years/semesters of the qualifying examination) is calculated by IIT Delhi as per the example given below:

Years	Ist Semester (%)		IInd Semester (%)	
Ist year	250/400	62.50	290/400	72.50
IInd Year	205/400	51.25	280/400	70.00
IIIrd Year	210/400	52.50	350/400	87.50
IVth Year	240/400	60.00	150/200	75.00
	<b>Total</b>	<b>905/1600</b>	<b>1070/1400</b>	

Aggregate (% age)  $1975/3000=65.83\%$  (of all the years/semesters)

- (c) Admission on part-time basis is further subject to the availability of seats for part-time and decision of the respective DRC/CRC/PEC.
- (d) Candidates who are in the final year of their qualifying examination can be considered for admission only if they complete the requirement of their final examination including Viva-Voce **by the date of the Registration** given on page 4. **Candidates must inform P.G. Section, IIT Delhi in writing by the date of Registration, if the requirements of their qualifying degree including Viva-Voce, if any, are not met by this date. Failure to inform the P.G. Section about non-completion shall result in forfeiture of entire fees deposited by them in addition to the cancellation of their admissions. In case a student registers without submission of final or provisional degree in the qualification examination/programme, he/she must submit documentary evidence to the P.G. Section certifying successful completion of the academic requirements for such a degree, issued by Competent Authority of the previous institution.**
- (e) The applications will be scrutinized by the Department/Centre/School concerned. The Department/Centre/School will call an adequate number of eligible candidates for a written test/interview which may be held as per dates mentioned above. The exact date for the test/interview will be communicated by the Department/Centre/School. For any query regarding the date of interview, selection result and operation of waiting list please contact the concerned Deptt./Centre/School at the Telephone Numbers. given on page 20 of this brochure.
- (f) Application incomplete, in any respect, is liable to be rejected.
- (g) The Ph. D. candidates called for appearing in test and/or interview will be paid to and fro II Class Railway Fare by the shortest route. However, this provision will not apply to the sponsored and part-time candidates.
- (h) No TA/DA will be paid to the candidates applying for M.S.(R) Programme.

- (i) A provisional list of applicants selected for admission and of applicants selected for the award of Assistantship along with those placed on waiting will be displayed on the Department/Centre/School notice board within a day of the test/interview. The selected candidates would be required to pay the first installment of fees soon after the admission offer letter is issued to the candidates failing which seats will be offered to those on the waiting list.

### **APPLICATION PROCEDURE**

Submission of Application is only through online procedure. Candidates are **NOT** required to send hard copy of the application form and bank challan. Online submission of the application form may be made by accessing the Institute website  [<http://www.iitd.ac.in/pgadmission>](http://www.iitd.ac.in/pgadmission). Candidates belonging to General/OBC category are required to pay for each application form a fee of Rs. 200/- and the candidates belonging to SC/ST/PH categories are required to pay Rs. 50/-. The bank charges will be borne by the candidate. For payment of application fee, the candidate will use "State Bank Collect" utility of State Bank of India: (<https://www.onlinesbi.com/prelogin/institutiontypedisplay.htm>)

### **REFUND OF FEES**

The whole amount of fees/other charges deposited by the students will be refundable after deduction of Rs.1,000/- if the candidates do not join the programme after paying the dues and leave the Institute by applying for a refund on or before the date of registration. On resignation after registration, the only security deposit will be refunded.

For refund of fees and/or security deposit the student must apply on the prescribed form available from the P.G. Section, IIT Delhi or the Institute Website: [http:// www.iitd.ac.in](http://www.iitd.ac.in).

### **IMPORTANT INSTRUCTIONS FOR FILLING APPLICATION FORM**

- (a) Separate application form should be filled for the Ph.D. programme for each Department/Centre.
- (b) Separate application form should be filled for each M.S.(R) programme.
- (c) Part-time/Sponsored (full-time) candidates must submit NOC/Sponsorship Certificate from their employer at the time of interview.
- (h) Filling of false information will lead to rejection of application/cancellation of admission.
- (i) Fill the programme code at the appropriate place in the Application Form. The Ph.D. programme codes are given in **Annexure-I** and M.S. (R) programme codes are given in **Annexure-II**.

## **CONTACT TELEPHONE NUMBERS**

1. For any query/clarification, please contact **P.G. Section** at the following telephone Nos.:  
Tel: 011-26591723, 011-26591737
2. For query regarding the date of interview, selection result and operation of the waiting list, please contact the concerned Deptt./Centre/School at the following Telephone Nos.(prefix area code 011):

### **DEPARTMENTS**

### **TELEPHONE**

Applied Mechanics	26591201
Biochemical Engineering & Biotechnology	26591001
Chemical Engineering	26591021
Chemistry	26591501
Civil Engineering	26591241
Computer Science & Engineering	26591291
Electrical Engineering	26591071
Humanities & Social Sciences	26591371
Management Studies	26591171
Mathematics	26591471
Mechanical Engineering	26591051
Physics	26591331
Textile Technology	26591401

### **CENTRES**

Applied Research in Electronics	26591101
Atmospheric Sciences	26591301
Biomedical Engineering	26596132
Energy Studies	26591251
ITMMEC	26591281
Instrument Design Development	26591431
Polymer Science & Engineering	26591421
Rural Development & Technology	26591121
National Resource Centre for Value Education in Engineering	26596585

### **SCHOOLS**

Bharti School of Telecommunication Technology & Management	26596200
Amar Nath and Shashi Khosla School of Information Technology	26596056
Kusuma School of Biological Sciences	26596104

### **RESEARCH PROGRAMMES: DOCTOR OF PHILOSOPHY (Ph.D.)**

The Institute offers research programmes leading to the degree of Ph.D. in the following areas in the various Departments/Centres/Schools.

#### **Department of Applied Mechanics [Code AMZ]**

**Research Areas in Solid Mechanics:** Large Deformations, Impact Mechanics, Elasticity, Piezothermoelasticity, Composite Materials and structures Plates and Shells, Non-linear Dynamics and Chaos, Railway Vehicle Dynamics, Off-Shore Structures, Smart Structures, Structural Stability, Snow Mechanics, Dynamic Plasticity, NanoComposites, Damage Mechanics, Soft Materials, Structural Health Monitoring, Functionally Graded Structures, Multi-Scale Modelling of Nano-Structures, Biomechanics/Cell Mechanics, Cardiovascular Biomechanics, Brain Biomechanics, Computational Surgery.

**Research Areas in Fluid Mechanics:** Internal and External Flows, Solid-Liquid Flows, Computational Fluid Dynamics, Hydrodynamic Stability; Turbulence, Aerodynamics; Turbulent Heat Transfer Compressible Flows, Fluid-structure Interaction

**Research Areas in Design Engineering:** Computer Aided Design, Design Engineering., Reliability Engineering, Engineering Alternative, Ergonomics, Reverse Engineering, Design and Analysis of Biomedical Devices, Compliant Mechanisms and Smart Instrumentation, Bio-inspired Engineering.

**Research Areas in Materials Engineering:** Structure-property correlations in advanced materials; Micro- and Nano-scale mechanical behavior of materials; Auxetic materials(Negative Poisson's ratio), Failure analysis Fracture mechanics Functionally graded materials; Nanomaterials; Phase transformations; Transformation plasticity; Porous materials; Lattice materials; Shape memory alloys; Amorphous materials; Severe plastic deformation; Electron microscopy; Materials characterization; Processing, characterization of light-weight metals and metal matrix composites; 3D printing; High-entropy alloys; Nano-scale friction and wear behavior of materials; In situ microscopic study of mechanical and tribological behavior.

#### **Department of Biochemical Engg. & Biotechnology [Code BEZ]**

**Microbial and Enzyme Engineering:** Analysis and design of microbial and enzyme reactors for production of industrially important products such as biofuels, industrial enzymes, biopolymers, organic solvents, biofertilizers, and biopesticides etc.; development of bio-sensors for detection of various analytes; Whole cell catalyzed biotransformations.

**Bioseparation and Downstream Processing:** Membrane-based separation processes, chromatographic separation processes, Membrane processes for water recycle.

**Metabolic engineering:** Application of metabolic engineering principles for the development of cell factories for the production of important metabolites including renewable chemicals and therapeutic compounds.

**Animal and plant cell culture:** Development of cell culture techniques for cultivation of plant and animal cells in specialized reactors for production of therapeutic compounds.

**Environmental Biotechnology:** The development of reactors and processes for stabilization of organic and industrial wastes; Laccase engineering for treatment of textile effluents; Effect of environmental factors on microbial community dynamics.

**Biochemistry and molecular biology:** Industrial enzymes, development of recombinant clones for over-production of enzymes and metabolites, development of expression systems in bacteria and yeasts, Human therapeutics production in yeast, bioenergetics and biological molecular machines, Nanoparticle-based drug delivery and protein-based nanodevices, cancer biology, microRNA biology.

**Bioinformatics and Genomics:** Genome editing with programmable nucleases; analysis and interpretation of next-generation sequencing data; traditional home-medicine and cancer big data analysis.

**Biophotonics:** Development of fluorescence and optical imaging methods for detection of single molecules to the whole cell. Application of these methods for biosensing of pathogenic microbes and cancer cells.

#### **Department of Chemical Engineering [Code CHZ]**

Mixing, Distillation and other separation processes, Particle technology, catalysis and reactor engineering, Petroleum refining engineering, Membrane synthesis & processes, Waste management, Environmental engineering, Biomass, Fluidization, Computer Aided Design, Modeling simulation and optimization, Interfacial engineering, Polymers, Computational fluid dynamics, Control of reactors, Fuel cells, Multiphase flow & reactors, Bioseparations and Bioprocessing Complex fluids, Polymer rheology, Process operations planning and scheduling, Biosimilars, Quality by design, Protein characterization, Colloid science, Nanotechnology, Biosensors, Renewable hydrogen and fuel cells.

#### **Department of Chemistry [Code CYZ]**

Asymmetric synthesis & catalysis, Biochemistry (Enzyme technology, Microbial Biochemistry, Fermentation & Bio-remediation, Cloning & Proteomics), Bio-inorganic chemistry, Bio-organic chemistry, Bio-physical chemistry, Carbohydrate chemistry, Coordination chemistry, Fluorescence Spectroscopy (Ensemble & Single molecule), Nano-materials (Optical Properties & Photovoltaics), Nanocatalysis in ionic liquids, NMR spectroscopy, Organometallic chemistry, Peptide synthesis, Quantum & Classical computer simulation on chemical & biological systems, Solid state chemistry, Supramolecular chemistry (Molecular Organisation & Recognition), Synthetic & Mechanistic organic chemistry, Theoretical Chemistry.

#### **Department of Civil Engineering [Code CEZ]**

**Environmental Engineering :** Urban air quality management; indoor air pollution; water and waste water treatment; Emerging water contaminants (Nano particles, Antibiotics); urban water and waste water Management; Non-point source Pollution; Membrane Biological Treatment Process; Modeling, simulation and optimization of Environmental systems; Environmental Impact Assessment; Human Health Risk Assessment; solid waste management; incineration; circulating fluidized bed operations; Landfill Management; Carbon sequestration; sustainable development (Urban cities/growth centres); Environmental Risk Analysis, GIS and Remote Sensing Applications for Environmental Management. Aerosol characterization, local air quality, climate change and health impact.

**Geotechnical Engineering:** Soil Mechanics and Foundation Engineering; Rock Mechanics, Rock Engineering, and Underground Structures; Geo-environmental Engineering; Landfills; Ash Ponds and Ash Utilization; Energy Geotechnology; Slope Stability and Dams; Ground Improvement; Geosynthetics; Reinforced Soils; Soil Dynamics and Earthquake Geotechnics; Foundations for Industrial Machines; Site

specific response studies; Engineering Geology; Seismic Hazard Analysis and Microzonation; Expansive Soils; Geophysical Methods; Geotechnology for tracks and pavements; Blast and Impact Analysis; Dynamic Behaviour of Tunnels and Slopes; Landslides in Static and Dynamic Conditions; Offshore Geotechnology; Constitutive Modelling; Numerical Methods.

**Structural Engineering** : Analysis and design of structures; tall buildings; bridges; Earthquake engineering; wind engineering; offshore structures; masonry, RCC and steel structures; Construction Management; Construction Technology; Concrete Technology; structural dynamics; structural control; constitutive modeling; computational methods; modeling of damage, plasticity and creep of concrete; durability of concrete; rebar corrosion; modeling of cements; supplementary cementitious materials; composites; high performance concrete; self-compacting concrete; financial analysis; contract administration, quantitative methods in construction management; Infrastructure Project Management Risk and Financial Management; structural health monitoring; smart materials and structures; tensegrity structures; biomechanics; engineered bamboo structures; artificial intelligence; damage assessment and strengthening; microstructural modeling; mechanics of composite materials; non-destructive testing and evaluation using ultrasound; subsurface imaging using ultrasonic wave propagation; piezoelectric energy harvesting

**Transportation Engineering** : Transport planning; Transport policy; Transportation safety; Construction work zone safety; Heterogeneous traffic flow modeling; Traffic safety and capacity of hill roads; Mass transportation planning; Urban transport infrastructure planning and design; Non-motorized transport planning; Modeling of pedestrian behavior; Activity-travel behavior analysis; Network modeling; Transportation logistics and optimization; Traffic operations; Geometric design of transportation infrastructure; Characterization of pavement materials; Pavement design (flexible and rigid); Damage modeling of bitumen and bituminous mixtures; Constitutive modeling of pavement materials; Recycling of civil infrastructure materials; Rheology of asphaltic materials; Condition assessment of highway infrastructure; Pavement management systems; Highway engineering; Airport infrastructure.

**Water Resources Engineering** : Hydrology in natural and urban environment; Hydrological modeling and simulation; Stochastic processes; Data mining in hydrology; Flood forecasting and modeling; Snow and glacier hydrology; Snow dynamics; Hydroclimatology; Climate change effects on water resources; Watershed modeling; Large river basin modeling; water resources systems, planning and management; Water allocation; Water resources conflicts; Irrigation management; Flow through porous media; Groundwater modeling; Groundwater contamination; Contaminant transport modeling; Leachate pollution; Bioremediation; River water quality modeling; Environmental impact assessment of water resources projects; Surface and subsurface drainage; Hydraulic structures; Sediment transport; Application of numerical methods, CAD, CFD, FEM, GIS, and Remote sensing in Water Resources Engineering. Slurry Pipeline, CFD modeling of Multiphase Flows.

### **Department of Computer Science & Engineering [Code CSZ]**

Computer Architecture, VLSI Design Automation, Embedded Systems, Hardware-Software Co-design, System-level Design and Design Space Exploration, ASIP Synthesis, Computer Vision, Computer Graphics, Virtual environments, Geometric modelling, Model representation, 3D Visualization and Animation, Image Processing, Artificial Intelligence, Natural Language Processing, Databases, Data Mining, Computer Networks, High-Speed Networks, Wireless and mesh networks, WiFi/WiMax, ad hoc and Sensor networks, Delay Tolerant Networks and Opportunistic communication, Multimedia systems, Peer-to-peer networking, Network measurement and modelling, Social networking, Protocol validation and verification, Analysis of algorithms, Randomized and Approximation algorithms, Graph algorithms, Computational Geometry, Combinatorial Optimization, Web-related computation, Parallel and Distributed Computing, Programming Language Semantics and Design, Semantics of Concurrency and

Distributed Computation, Formal Methods and Verification, Compilers, Software Engineering, Service-oriented computing, Foundations and Models of Computing, Computational and Systems Biology, Cryptography, Operating System, Location-based services, Security, Neuroimaging, HPC, Theoretical Computer Science, Software Systems, Data Analytics, ICD for Development

### **Department of Electrical Engineering [Code EEZ]**

**Electronic Engineering:** Electronic Circuits, Microprocessor, Instrumentation, Microelectronics, VLSI, Digital Signal Processing, Computer Aided Circuit Design, Graph Theory, Biological and artificial, Neural Networks, Testing and Fault Diagnosis, Fault-tolerant Design, Mixed-signal design.

**Power Engineering :** Electrical Machines, Energy Conversion, Power Electronics, Power Quality, Drives, Powers System, Protection, Stability, Optimization, Energy Conservation, HVDC & FACTS, Computer Applications in Power (computational intelligence, microcomputer/DSP control, CAD software & application) Renewable Energy Systems (Small Hydro, PV, Wind), Energy Audit & Efficiency.

**Communication Engineering:** Signal Processing, Speech and Image Processing, Coding & Information Theory, Communication Systems, Optoelectronics, Optical Communications, Communication Networks, Wireless and Mobile Communications, Microwaves, Antennas.

**Computer Engineering:** Computer Vision, Multimedia Systems, Image Processing, Computer Networks, Computer Architecture, Embedded Systems, Mobile computing, soft computing, Pattern Recognition, Artificial Intelligence, Information Technology, Music information retrieval, Bioinformatics.

**Control Engineering :** Robust Control, Intelligent Control, Robotics, Optimal Control, System Identification, Neuro-Fuzzy Control, Reinforcement Learning Control, Nonlinear Systems and Control, Dynamical Systems, Applications to Biomolecular Circuits, Flight Control and Navigation, Adaptive Control, Cooperative Control and Path Planning, Sensor Fusion, Guidance, Navigation and Flight Control, Sliding Mode Control, Interval Analysis in Control Design, Computational Methods, for Simulation and Control, Modeling and Model Order Reduction, Attitude Control and Structural Control, Numerical Modeling and Simulation Embedded Control System.

### **Department of Humanities & Social Sciences [Code HUZ]**

Literature, Sociology, Psychology, Linguistics, Philosophy, Policy, Economics.

NOTE: Candidates must refer to the Department website (<http://hss.iitd.ac.in/areas>) for details on areas of specialization in which applications will be considered.

### **Department of Management Studies [Code SMZ]**

Production, Management and Operations research, Sustainable and Big Data Operations, International Manufacturing Network, Enterprise Resources Planning, Project Management, Modeling and Simulation of Operations, Business Intelligence, Healthcare Operations System Analysis, Management of Information Technology, Network Security Management, Management Information System & Decision Support System, Social Media, Digitization and Smart Cities, Machine Learning, ICTs, Development and Business, Business Analytics, Electronic Commerce, Human Resource Management, Organization Management / Behaviour / Development, Business Ethics, Leadership, Financial Analysis, Financial Management, International Financial Management, Capital Markets, Derivative Securities, Portfolio Management, Mutual Funds, Banking, Financial Markets and Services, Risk Management, Behavioural Finance, Corporate Governance, Corporate Social Responsibility, Managerial Economics, International Economics, Productivity and Efficiency Analysis, Business Forecasting, Economic Feasibility & Techno-economic Analysis, Sustainable Development, Socio-economic Analysis, Energy Economics, Econometric Methods and Applications, Macroeconomic Theory and Policy,

Environmental Economics and Climate Change, Marketing Management, Industrial and Hi-Tech Marketing: Public Sector Management, Entrepreneurial Management, Management of Technology, Corporate Strategy, Global Competitiveness, Strategic Innovation, Entrepreneurship, Total Quality Management, Flexible Systems Management, Business Process Re-engineering, Strategic Business Management, Knowledge Management, International Business, Intellectual Property Rights.

#### **Department of Mathematics [Code MAZ]**

Pure Mathematics, Applied Mathematics, OR & Statistics, and Theoretical Computer Science.

#### **Department of Mechanical Engineering [Code MEZ]**

**Design Engineering:** Mechanical Vibrations, Rotor Dynamics, Damped Structures, Composite Structures, Smart structures, Active Vibration Control, Experimental Modal Analysis & Identification, Structural Dynamic Modification, Finite Element Model Updating, Dynamic Design, Noise Engineering, Condition Monitoring, Bearing Dynamics, Lubrication, Mechanical System Design, Precision Machine Design, Computer Aided Mechanical Design, Computer Controlled Mechanisms, Vehicle Dynamics, Modelling the Impact of Vehicles, Impact Biomechanics, Concurrent Engineering Design, Mechanisms, Robotics (including Medical Robotics) ,Medical Devices/instruments, Multibody Dynamics, Application of Multibody Dynamics in Design and analysis of Rural Engineering Systems, Computational Mechanics ,Fracture Mechanics, Fatigue & Failure analysis ,Experimental solid Mechanics, Mechatronics, Sensors and Actuator Design, MEMS, Design of Microsystems, Nanomechanics, Artificial Intelligence Applications in Mechanical Engineering & Expert Systems for Design & manufacturing and Mechanical Engineering Applications to Medical Science. Public policy and governance, Transportation (Railways, Freight ).

**Thermal Engineering:** Internal Combustions Engines, Phenomenological and Multi-dimensional modeling of engines, Combustion, Radiation from flames, Engine Simulation, Turbocharging, Combustion Generated Pollution, Alternate Fuels, Utilization of biogas, Biomass gasification, Energy efficient kilns, Energy flow through radial rectilinear cascades, Centrifugal and axial compressors Internal flow and Laser anemometry, Optimization of power plants, Sustainable Energy Systems, Computer Simulation and Design of Thermal Systems, Refrigeration & Air Conditioning Systems, Thermal Comfort, Fire Research, Air Water Spray Injection, Waste Heat Utilization, Energy Conservation, Renewable Energy Sources, Heat Transfer, High temperature natural convection Microchannel Heat Exchangers, Particle-laden Flow, Fluid Mechanics & Machines, Turbulence, Computational Fluid Dynamics (CFD), Turbomachines, Numerical modeling of radiation heat transfer in participating media; Heat and mass transfer in porous Media; Solar cooling; Micro/ nanoscale heat transfer; Theoretical/computational modeling of mass transfer, Charge transfer; fluid flow in microfluidic/nanofluidic devices.

**Production Engineering:** Metal Cutting, Metal Forming, Welding, Metal Casting, Material Characterization, Nontraditional Manufacturing Processes, Measurements & Metrology, Grinding of Ceramics and Metal Matrix Composites, Processing of Polymers & Composites, Injection Molding, Microcellular Injection Molding, Finite Element Applications in Manufacturing, CAD/CAM, Rapid Prototyping, Intelligent Manufacturing, Micro & Nano-Manufacturing, Biomaterials and Medical Implants, Nanocomposites, Modeling of Material Behavior, Lean concepts in Machine Tool Design. Manufacturing Automation, Magnetorheological Finishing.

**Industrial Engineering:** Quality, Reliability and Maintenance, Lean Manufacturing, Agile Manufacturing Productivity Management, Operations Research, Operations Management, Project Management, Supply Chain Management, Applied Probability Models, Decision Support Systems, Value Engineering, Flexible Systems, Healthcare Systems, Intelligent Manufacturing Systems, e-Business, Reverse Logistics, Financial Engineering, Wireless Systems.

### Department of Physics [Code PHZ]

**Materials and Condensed Matter Physics:** Thin Films, Materials and Devices, Novel Functional Materials, Nanomaterials; Carbon nanotubes, Field emission, Nanocomposites; Lattice Dynamics, Semiconductors and Amorphous Materials, Electronic Ceramics, Microwave Materials, Microwave Processing, Quantum Functional Materials, Nanomagnetism and Spintronics, Superconductivity, 2D Materials ; Graphene, Topological Insulators, Material for next-generation photovoltaic devices .

**Optics and Photonics:** Holography, High-density Data storage, Liquid Crystals, Nonlinear Phase Conjugation, Optical Information Processing, Optical Data Security, Nonlinear Optics, Nonlinear Guided Wave Optics, Singular optics, Solitons, Quantum Optics, Quantum Photonics, Fiber Optics, Integrated Optics, Fiber Optic Sensors and Biosensors, Fibre Optic Components, and devices mid - IR, Terahertz (TH<sub>3</sub>) in guided wave optics, Nanophotonics, Laser Spectroscopy and Applications, Terahertz Spectroscopy and Applications, Ultrafast Dynamics, Laser Processing and Fabrication, Green and Biophotonics, Photonic Metamaterials, Bio-Medical Imaging, Inverse Problems in Imaging, Optoelectronics

**Plasma Physics:** Particle acceleration, Nonlinear Waves and Instabilities in Plasmas, Thermonuclear Fusion, Microwaves and Plasma Interaction, Solitons in Plasma, Space Plasmas, Terahertz (THz) Radiation Generation, Hall Thrusters, Interaction of Plasmas with Materials

**Theoretical Physics:** Mathematical Physics, Statistical Mechanics and Computational Physics, Theoretical studies in ultra-cold atoms, Nuclear and Particle Physics, Ultrafast Optics, Theoretical condensed matter, Quantum computation & information processing, Theoretical methods for Biological systems.

**Interdisciplinary:** Optical Spectroscopy under extreme conditions, High Pressure-High Temperature Physics, Energy Storage and alternative Energy Materials, CO<sub>2</sub> sequestration, Mineral Physics

### Department of Textile Technology [Code TTZ]

**Textile Engineering:** Design and analysis of yarn and fabric formation systems: rotor spinning, ring spinning, air jet spinning, friction spinning, weaving knitting, nonwovens, braiding etc.; structural mechanics of textiles; high stress elastic materials; apparels and garments; comfort, handle and other functional aspects of fibrous assemblies; design and development of technical textiles: geo-textile, filter fabrics, medical textiles, protective textiles, textile composites etc; systems analysis; textile production and marketing: operation management and supply chain management; textile instrumentation and machine development; modeling and simulation of textile processes and products; quality management.

**Textile Chemical Technology:** Textile chemical processing: preparatory processes, dyeing, printing, and finishing, surface functionalization by plasma and UV excimer lamp; micro and nanoencapsulation; conducting textiles; natural dyes; bioactive textiles; textile ecology and environment.

**Fibre Science & Technology:** Synthesis and characterization of advanced polymeric materials; fibre formation processes; Modelling and simulation; Structure-property correlation; Functional and responsive polymers, smart & intelligent textiles; modification of natural and synthetic fibres: Nanotechnology in Textiles: nanofibers by electrostatic spinning, nanomaterials; synthesis and application in textiles; coated

textiles: polymer nanocomposites green composites; medical textiles, tissue engineering; sustainability and polymer recycling.

#### **Centre for Applied Research in Electronics [Code CRZ]**

Signal Processing; Underwater Acoustics, Speech and Audio, General Acoustics, Acoustic Imaging, Multi-Sensor Data Fusion, Digital Communications, DSP Algorithms; Microwaves and RF: Active and Reconfigurable Circuits and Antennas, Millimeter Wave circuits and sub-systems, RF MEMS, Wideband Microwave Circuits, Modeling of Active Devices; Microelectronics: Micro-Electro-Mechanical Systems (MEMS) Technology, Nanoelectronic & Optoelectronic Devices, Thermal, Acoustic and Optical Non-Destructive Characterization.

#### **Centre for Atmospheric Sciences [Code ASZ]**

Meteorology, Oceanography, Air Pollution and Climate change.

#### **Centre for Biomedical Engineering [Code BMZ]**

Electrical / Electronic/ Instrumentation Engineering; Mechanical/Manufacturing/Production Engineering; Chemistry/ Biochemistry/Polymer Chemistry/ Material Sciences/ Pharmaceutical Sciences; Chemical Engineering; Mathematics/Physics/Bio-Physics; Computer Science Engineering; Biomedical Engineering; Biotechnology, MBBS/BDS/Homeopathy (B.H.M.S)/Physiotherapy (BPT) /Veterinary Sciences.

#### **Centre for Energy Studies [Code ESZ]**

IC Engines, Electrical Energy Systems, Thermal Engineering, Renewable Energy Devices and Systems, Energy Economics and Planning, Plasma Science and Technology, Energy Conservation and Management.

#### **Centre for Polymer Science & Engineering [Code PTZ]**

Synthesis of Speciality Polymers; Structure-Property Correlation in Polymeric Materials; Rheology and Processing of Polymers; Polymer Blends and Alloys; Fibre / Particulate Filled Thermoplastic / Thermoset Composites, Degradation and Stabilization of Polymers; Mechanical and Thermal Properties of Polymeric Systems, Reactive Polymer Processing; Modification of Polymers; Photodegradable Polymers; Morphological Studies of Polymers; Polymer nanocomposites; Smart Polymers; Micro / Nano-Hydrogels; High performance Polymeric materials; Microcellular processing of polymers Modelling and Simulation in Polymer Processing; Polymer membranes Design and Stress Analysis of Engineering Component from Polymeric Materials, Polymer Electronics; Synthesis of conjugated organic materials; Olefin Polymerisation Catalysts ;Deformation and Fracture of Polymers and Composites, Tribology of Polymeric Materials; Biodegradable Polymeric materials for drug delivery and packaging applications; Block Copolymers and Phase behaviour EMI Shielding, Surface Engineering using controlled radical Polymerization.

#### **Centre for Rural Development and Technology [Code RDZ]**

Artisanal technologies and rural industries; Bamboo technologies; Biogas production and enrichment, animal energy; Dairy and Food Processing; Biofuels, Biofertilizers and Biopesticides; Biomass

production, conversion and utilization systems; Environmental microbiology and bioremediation; Natural products including aromatics, medicinal plants, nutraceuticals; Pesticide residue and food safety; Eco-friendly Grain Storage System; Renewable energy technologies; Rural energy systems; Biomass Combustion, Clean Cookstoves; Solid Waste Management, Treatment of Industrial/domestic waste; Wasteland reclamation; Tissue Culture; Mushroom Technology; Ethnoveterinary Medicine; Ecological Sanitation.

### **Industrial Tribology, Machine Dynamics & Maintenance Engineering Centre [Code ITZ]**

**Tribology:** Tribology of Polymers & composites, nano-composites, ceramics and metals. Wear Mechanisms and modeling of metallic and non-metallic materials and surface engineering. Boundary and Hydrodynamic lubrication, E-HD lubrication, lubricant characterization and analysis, tribology of bearings and other machine elements. Pneumatic, conveying of bulk solids, operational problems like erosion and degradation.

**Maintenance Engineering and Machine Dynamics:** Condition based maintenance, signature analysis, vibration, acoustic emission, temperature and wear debris monitoring techniques, maintenance planning and control, computer-aided maintenance audit, reliability, availability and maintainability (RAM) engineering, vibration & noise analysis and control, risk analysis and safety, non-destructive testing, residual life estimation, failure analysis, performance and dynamic study of machine elements and equipment like pumps, compressors, turbines, design for maintenance, etc.

### **Instrument Design & Development Centre [Code IDZ]** CAD and Simulation of Electronic Systems.

Microprocessor Application, Power Electronic and Control, Electric Drives, Electromagnetic Sensors and Instrumentation, Smart Sensors and Sensors Networks, Digital System Design and DSP Applications, Digital Holography, Digital Speckle Pattern Interferometry, Flame Tomography, Optical Coherence Tomography, Fiber-Optic Sensors, Optical Metrology, Diffractive, Aspheric and Freeform Optics, Optical Metrology, Micro-Optics, Aspheric freeform optics.

Computer Aided Product Design, Human Factors in Design, Applied Ergonomics, Graphic Design, Interaction Design, Design for UX/UI, Human Computer Interaction, Design and Culture, Customer Persuasion and e-commerce, Design for sustainability, Geometric Design, Typography, Design Computing, Design Automation, Product Life-Cycle Management, Design Optimization, Design Informatics, Visual Communication, Communication Design, digital Prototyping, Inclusive Design, Design Management.

### **National Resource Centre for Value Education in Engineering [NRZ]**

Philosophy of Values; Professional Ethics; Interaction of Science, Technology and Human Values.

### **Amar Nath and Shashi Khosla School of Information Technology [Code ANZ]**

Scalable & Dependable Computing, Information Security, Information Storage and Retrieval, High Speed Networks, Internet of Things, Multimedia Systems, Embedded Systems and Sensor Networks, HCI (Human-Computer Interfaces), Image Processing, Biometrics, Computer Vision, Robotics and Intelligent Systems, Medical Applications of IT, Assistive Technologies, Computational & System Biology, Computational Neuroscience, ICT for Development, Geographical Information Systems, Mobile and Web-Based Computing.

### **Bharti School of Telecommunication Technology and Management [Code BSZ]**

Telecom Networks, Telecom Software, Wireless Technologies, Optical Networks, Signal Processing, Telecom Systems Design, Planning and Management, Regulatory and Policy Aspects of Telecom Services and Systems, Embedded Telecom Systems, Telecom Network Management, Performance Analysis of Communication System and Resource Management.

### **Kusuma School of Biological Sciences [Code BLZ]**

Computational Biology, Systems Biology, Chemical Biology, Cellular Biophysics, protein folding & misfolding with focus on infectious diseases and non-communicable disorders, Chaperone-assisted protein folding, Molecular biophysics of protein folding, unfolding and conformational properties, Cognitive and computational neuroscience, Viral diseases, Nanoparticle-based targeting, Structural Biology, Diagnostic Virology, Cancer Biology, Plant-based therapeutics, Marine Bioprospecting, insulin signaling and insulin resistant diabetes, Leishmaniosis

### **Transportation Research & Injury Prevention Programme [Code TRZ]**

Transportation Planning; Traffic Flow Modelling and Optimization; Public Transport Systems; Sustainable Urban Transport; Highway Safety; Vehicle Crash Modeling; Road Traffic Injury Prevention. Pedestrian and Non-Motorized Vehicle Safety, Urban Freight.

**M.S.(Research) Programme offered**

<b>Department/Centre/ Interdisciplinary Programme</b>	<b>Programme</b>	<b>Programme Code</b>
<b>M.S. (Research)</b>	Applied Mechanics	AMY
	Amar Nath and Shashi Khosla School of Information Technology	SIY
	Bharti School of Telecommunication Technology and Management	BSY
	Chemical Engineering	CHY
	Civil Engineering	CEY
	Computer Science & Engineering	CSY*
	Electrical Engineering	EEY
	Mechanical Engineering	MEY
	School of Biological Sciences	BLY

\* Admission to M.S. (Research) programme in Computer Science & Engineering Department (CSY) is limited to candidates who have a Qualifying degree in Computer Science & Engineering, Electrical Engineering, Information Technology, M.Sc. Operations Research, Electronics and Communication, M.Sc. Statistics, M.A./M.Sc. Math, M.Sc. Math (with exposure to appropriate level courses in Computer Science) and MCA (with Math and Science at B.Sc. level).

In addition to the above, both the programmes (MCS and CSY) are limited to candidates who have appeared in GATE with Computer Science and Engineering or Information Technology.

## **Additional Important Information for Candidates**

- Ragging in any form is banned in IIT Delhi.
- The Institute treats ragging as a cognizable offense and stern action will be taken against the offenders.
- IIT Delhi will not be responsible for any postal delays.
- All matters of disputes will be subject to legal jurisdictions of the courts in Delhi only.
- The Institute reserves the right to amend, without any notice, any provisions stated in this brochure.