

**INDIAN INSTITUTE OF TECHNOLOGY
DHARWAD**



॥ सा विद्या या विमुक्तये ॥

भारतीय प्रौद्योगिकी संस्थान धारवाड
Indian Institute of Technology Dharwad

Department of Mathematics

Information Brochure

Ph.D. Admissions

Autumn Semester (2020-2021)

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A. SCHEDULE OF Ph.D. ADMISSION

Detailed schedule of admission process will be announced later on the institute website.

Deadline for submission of online application: ~~5th May~~ 21st May 2020, 11:59 pm.

First shortlist of eligible applicants: 28th May 2020 (tentative)

All potential candidates are requested to visit institute website regularly for updated information about the schedule, especially in context on ongoing Coronavirus (COVID-19) related developments. Future updates regarding the admission process will be made available on the institute website under section Academics >> Admissions >> PhD.

B. ELIGIBILITY FOR ADMISSION

B.1 Qualifying Degree

The qualifying degrees are listed as following:

1. M.Sc. in Mathematical Science or Computer Science
2. M.Phil. in Mathematical Science
3. M.Tech. students with Computer Science, Mechanical or Electrical Engineering background.

B.2 Minimum score in the qualifying degree

Category	Educational qualification
General	The eligibility criteria in the qualifying degree is one of the following: (1) A minimum of 60% marks (without round off) in aggregate or (2) a minimum Cumulative Grade Point Average (CGPA) or Cumulative Performance Index (CPI) of 6.0 on the scale of 0-10; with corresponding proportional requirements when the scales are other than on 0-10, (for example, 4.8 on a scale of 0-8).
OBC (NC)	Same as general
SC/ST/PWD	A relaxation of 5% in the qualifying degree is applicable

B.3 Additional requirements

In addition to above, a candidate **must satisfy one of the following:**

1. M.Sc. in Mathematical Science or Computer Science - candidates should possess valid

GATE score.

2. M.Phil. in Mathematical Science are exempted possessing valid GATE score.
3. M.Tech. students with Computer Science, Mechanical or Electrical Engineering background – candidates are exempted from possessing VALID GATE score.
4. Junior Research Fellowship in Mathematical Sciences from CSIR, UGC, DST (INSPIRE fellowship), NBHM and other externally funded candidates are encouraged to apply and they are exempted from possessing valid GATE score.

B.4 Eligibility of applicants who are in the final phase of getting the qualifying degree

Students who are in the final phase of receiving above mentioned qualifying degree and who are likely to graduate before commencement of Autumn 2020 semester of IIT Dharwad are also eligible to apply. However, if offered, the admission to those candidates would be provisional. To join academic program at IIT Dharwad, such candidates need to furnish necessary documents regarding completion of the degree on the date of joining mentioned in the Section A above. They need to meet the criteria specified in section B.2. In the meanwhile, the aggregate academic performance announced by the respective university till the last date for submission mentioned in section A should be used to determine eligibility for application and same to be reported in the online application.

C. APPLICATION CATEGORIES & FINANCIAL SUPPORT

The Department of Mathematics admits Ph.D. candidates under the full time research scholarship or Teaching Assistantship (TA).

C.1 Teaching Assistantship (TA)

1. Funded by MHRD, the TAs are expected to assist in the academic/administrative work for smooth functioning of the Institute. Students under this category are entitled to financial support as per MHRD norms.
2. For students with MSc./M.Tech./M.E./M.Phil. or equivalent degree as the qualifying degree, the assistantship is payable for a maximum duration of 5 years or up to the thesis submission, whichever is earlier. At present, the monthly rate of assistantship is Rs. 31,000/- for the first 2 years and enhanced rate of Rs. 35,000/- for the remaining period.
3. For students with B.Tech./B.E. or equivalent degree and students with M.Sc. or equivalent as the qualifying degree and having valid GATE score or having Junior Research fellowship (JRF) of UGC/CSIR or DST INSPIRE/NBHM fellowship, the assistantship is payable for a maximum duration of 5 years or up to the thesis submission, whichever is earlier. At present, the monthly rate of assistantship is Rs.31,000/- for the first two years and enhanced rate of Rs. 35,000/- for the remaining period.

4. To get Teaching Assistantship, the students concerned must assist in teaching, research and/or administrative work as assigned by the respective Academic Unit to the extent of 8 hours of work per week.
5. The continuation of the assistantship will be subject to satisfactory performance of the duties assigned by the Departments as well as satisfactory academic performance.
6. As per MHRD directives, the employees of any organizations with or without pay are not eligible for admission under TA category. Candidates selected in this category have to resign from the current job and submit a relieving letter from their employer before joining the programme.
7. Students getting assistantships from the Institute may join projects sponsored by external agencies and obtain corresponding fellowships in lieu of TA ship.

C.2 Fellowship Awardees (FA)

Students with valid fellowship from CSIR, UGC, DBT, ICMR, NBHM etc. can apply in this category

Based on the information provided by the applicants, a short-list of candidates called for the selection process will be declared on the Institute website on the date specified in the schedule. Only the short-listed candidates are permitted to participate in the selection process.

D. GENERAL GUIDELINES for APPLYING ONLINE

1. Please read all the instructions given in the brochure carefully before filing up the application form.
2. Application fee has to be paid prior filling online application. The transaction details such as Reference No, Transaction Date and Name of the Account Holder have to be mentioned accurately in the application form. **The contact number mentioned in the remarks/comments field of the online payment mechanism has to match with the one which will be entered while filling the application form.** It is also recommended to upload a proof of payment of application fee in pdf format just before submission of the online form.
3. This information brochure and future updates regarding the admission process will be made available on the institute website under section Academics >> Admissions >> PhD.
4. You are required to submit the application form online. There are no downloadable forms available. After filling the form, you are advised to take a print and keep the same for future reference.
5. The application fee is as follows,

Women candidates	₹ 100/-
SC/ST/PwD category candidates	₹ 100/-

All other candidates	₹ 200/-
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6. The fee is to be paid by NEFT/RTGS Online Payment System. The details of the institute bank details are:
BANK: State Bank of India
Account Name: REGISTRAR IIT DHARWAD
Account No.: 35636327083
Branch: Main Branch, Dharwad
IFSC: SBIN0000833
7. The transaction details like: UTR/ITR/Transaction Number with date are to be necessarily provided in filling up the Online Application Form. **The Application Form without valid online payment details will not be considered. Application FEE is Non-Refundable.**
8. Applicants may find it convenient to keep following information handy while filling the application form online (whichever relevant): i) Skype Id, ii) passport size photo whose size is less than 50 kb, iii) application fee transaction details of application fee payment e.g. reference no, date of transaction, Name of account holder, phone no used for online payment, iv) Educational details from secondary school onwards, v) GATE qualification details, vi) Statement of Purpose (pdf file), vii) proof of application fee payment (pdf file), viii) list of fellowship/ awards, ix) publications, x) any other achievements/information.
9. Economically Weaker Sections (EWS) candidates may note that the limit of annual income is ₹ 8laks for determining the eligibility for benefit under Economically Weaker Sections (EWS) reservation. The EWS certificate issued by the Competent Authority in the prescribed format must be submitted at the time of admission.
10. Candidates belonging to OBC – NC (Non Creamy layer) as per Government of India norms should produce certificate from competent authority at the time of selection.
11. Check your emails regularly for any updates from the institute regarding the selection process
12. Keep checking institute website regularly for updates regarding the selection process. Shortlisted candidates list will be uploaded on the institute website as per the schedule given above.

Candidates called for written test / interview should bring with them Photo ID Card, Admit Card, Printed Copy of Online Application Form, Photocopies of Academic Transcripts & Experience Certificates, Caste Certificate (if applicable), PwD Certificate (if applicable), EWS Certificate (if applicable), Thesis/Dissertation/Report/Publications and all other relevant documents.

E. GUIDELINES for SHORTLISTED APPLICANTS

E.1 General information

1. Reporting time: **To be announced later online.**
2. Online written test will begin on: **To be announced later online.**

3. Based on the performance in the online written test, some of the candidates will be shortlisted for the interview.
4. Interviews will be held on: **To be announced later online.**
5. Very limited **accommodation/transportation *may be facilitated*** in the campus during the written test/interview. Details will be decided later and the Institute reserves the right to cancel the same at short notice depending upon the future circumstances.
6. Applicants should bring:
 - a. Photo ID card
 - b. Printed copy of the application
 - c. Thesis/dissertation/report of M.Tech. or equivalent degree
 - d. Copy of certificates and mark sheets
 - e. Two passport size photographs
 - f. Scientific calculator
 - g. Copy of publications (if any)

E.2 Examination policy

1. Mobiles are not allowed in the examination hall or during the interview(s).
2. Candidates are responsible for their own belongings during the selection process, especially, the items that you leave outside before entering the examination hall.
3. Candidates are required to bring all documents mentioned in section E for the selection process.
4. Delayed candidates may not be allowed to take the exam after 20 minutes of exam start time and no one will be allowed to leave the exam hall before 30 minutes once exam is started.

F. MODALITY OF THE SELECTION PROCESS

Only the short-listed applicants are permitted to participate in the selection process.

The selection process consists of a written test and an interview. Candidates shortlisted based on the selection criteria are eligible to attend the written test. Questions will be objective and will be based on the syllabus given in Section H.

Candidates shortlisted from the written test are eligible for the interview. If necessary, an applicant may have to appear before the interview panel more than once. The details of the tests/interview are given in the following sections.

F.1 Details of the written test

1. There will be a 120-minute objective type test.
2. Syllabi are given in Section H.
3. Each question will have 4 choices out of which only one will be correct.
4. The exam will have negative marking scheme. For MCQ questions, 1/3rd of the points allotted for that question will be deducted for wrong answers.
5. It is the responsibility of the applicant to note the results of the written test. The results would be displayed at the location/notice board; announced during the test.

6. Results will not be informed to the applicants personally, and no complaints in that regard would be entertained.

F.2 Details of the interview

A personal interview is conducted for each applicant who is successful in the written test.

During the time of interview, a candidate should be able to indicate his/her interest in one of the areas mentioned in section G. The applicant is strongly advised to read about the basics regarding the area of specialization and the topic that he/she wishes to do a Ph.D. in.

G. RESEARCH TOPICS

The research topics for Ph.D. are broadly classified as given below.

1. **Commutative Algebra**
2. **Numerical Analysis and Applied Mathematics**

H. SYLLABUS

For the written test, the following syllabus will be followed.

1. **Analysis:** Elementary set theory, finite, countable and uncountable sets, Real number system as a complete ordered field, Archimedean property, supremum, infimum. Sequences and series, convergence, limsup, liminf. Bolzano Weierstrass theorem, Heine Borel theorem. Continuity, uniform continuity, differentiability, mean value theorem. Sequences and series of functions, uniform convergence. Riemann sums and Riemann integral, Improper Integrals. Monotonic functions, types of discontinuity, functions of bounded variation, Functions of several variables, directional derivative, partial derivative, derivative as a linear transformation, inverse and implicit function theorems. Metric spaces, compactness, connectedness. Normed linear Spaces. Spaces of continuous functions as examples.
2. **Linear Algebra:** Vector spaces, subspaces, linear dependence, basis, dimension, algebra of linear transformations. Algebra of matrices, rank and determinant of matrices, linear equations. Eigenvalues and eigenvectors, Cayley Hamilton theorem. Matrix representation of linear transformations. Change of basis, canonical forms, diagonal forms, triangular forms, Jordan forms. Inner product spaces, orthonormal basis. Quadratic forms, reduction and classification of quadratic forms.
3. **Complex Analysis:** Algebra of complex numbers, the complex plane, polynomials, power series, transcendental functions such as exponential, trigonometric and hyperbolic functions. Analytic functions, Cauchy-Riemann equations. Contour integral, Cauchy's theorem, Cauchy's integral formula, Liouville's theorem, Maximum modulus principle, Schwarz lemma, Open mapping theorem. Taylor series, Laurent series, calculus of residues. Conformal mappings, Mobius transformation.
4. **Algebra:** Fundamental theorem of arithmetic, divisibility in \mathbb{Z} , congruences, Chinese Remainder Theorem, Euler's phi-function, Groups, subgroups, normal

subgroups, quotient groups, homomorphisms, cyclic groups, permutation groups, Cayley's theorem, class equations, Sylow theorems, Rings, ideals, prime and maximal ideals, quotient rings, unique factorization domain, principal ideal domain, Euclidean domain, Chinese Remainder Theorem.

I. INFORMATION PERTAINING TO THE HOSTELS

About IIT Dharwad	Kindly visit the website https://www.iitdh.ac.in/ for available facilities
Hostel Room Allocation	You will be given your room key at the time of registration. Each room accommodates approximately four students and has an attached bath & toilet.
Are hostel rooms furnished	Each student is given a cot, chair, table and wardrobe. Students can purchase mattress/bedding, bucket etc. locally.
Possession of motorized vehicle	NOT ALLOWED, however bicycle is permitted in the campus.
Climatic conditions	Generally, it will be raining, windy & cold. It is suggested that you carry protective clothing accordingly.

J. FEES, DEPOSITS & HOSTEL RENT

S. No	Amount (INR)	Amount (in INR) for General/OBC/EWS	Amount (in INR) for For SC/ST/PwD
A. One-time payment at the time of admission			
1	Admission fee	2,200.00	2,200.00
2	Thesis fee	2500.00	2500.00
3	Medical examination	400.00	400.00
4	Provisional certificate	500.00	500.00
5	Student welfare fund	1,000.00	1,000.00
6	Modernisation & upgradation	2500.00	2500.00
7	Identity card	500.00	500.00
	Sub-total (A)	9,600.00	9,600.00
B. Per semester fee			
1	*Tuition Fee-Statutory fee	2500.00	00.00
2	Examination fee	1,000.00	1,000.00
3	Registration fee	750.00	750.00
4	Gymkhana fee	1,750.00	1,750.00
5	Student benevolent fund	500.00	500.00
6	Medical fee	1,500.00	1,500.00
7	Hostel rent	2,000.00	2,000.00
8	Electricity & water charges	3,000.00	3,000.00
9	Hostel establishment charges	3,000.00	3,000.00
10	Mess establishment charges	1,550.00	1,550.00
11	Student association insurance fund	200.00	200.00
	Sub-total (B)	17,750.00	15,250.00
C. Deposits (refundable) to be paid at the time of admission			
1	Institute security deposit	1,000.00	1,000.00
2	Library security deposit	1,000.00	1,000.00
3	Mess security deposit	1,000.00	1,000.00
	Sub-total (C)	3,000.00	3000.00
GRAND TOTAL FEE (A+B+C)		30,350.00	27,850.00

NOTE:

1. All the students are required to submit the **Mess Advance of ₹ 26,000.00/-** per semester by online payment method along with the course fee.
2. * Students admitted under External category (EX) will pay tuition-statutory fee of ₹ 25,000/- per semester (**Grand total fee of ₹52,850/-**). It shall be noted institute will incur semester continuation fee of ₹ 5000/- when a candidate joins parent organization after finishing the required course work at IIT Dharwad.
3. * IIT Dharwad reserves the right to revise the tuition fee-statutory fee.

Appendix A: Sponsorship Certificate for Ph.D. External Registration (EX)

(To be typed on letterhead of the Sponsoring Organization)

Name of the applicant:

Name of the sponsoring organization:

Address:

Present Designation of the applicant:

Present status of the applicant: (Permanent/Semi-permanent/Temporary)

Division where research work is proposed to be done:

Name of supervisor from the sponsoring organization:

(Bio-data of supervisor to be enclosed giving details of designation, qualification, research experience etc.)

Details of facilities relevant to the research problem which will be made available to the candidate by the organization.

Statement of proposed Co-supervisor (external)

If Shri / Kum. / Smt. _____

is registered for the doctorate degree, I, _____

, agree to act as his/ her research Co-supervisor along with the research Supervisor from IIT Dharwad.

Date:

Signature of proposed Co-supervisor (external)

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Statement of sponsoring authority

If Shri. /Kum. / Smt. _____

is admitted to the Ph.D. programme, we shall allow him/ her to undergo the programme of studies at IIT Dharwad.

Further, we shall fully relieve him/her from normal duties to complete the course work requirement (and qualifier examination, if applicable) at IIT Dharwad.

During the period of Doctoral programme, the candidate will be permitted to carry out his / her research work at our laboratories / organization and will be given the required facilities.

We also give our consent to Shri. /Kum. / Smt./ Dr. _____

of our organization to be the Co-supervisor (external) of the Ph.D. thesis, along with a faculty member of IIT Dharwad as the Supervisor.

Date:

Signature and Seal of the Sponsoring Authority

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