

INDIAN INSTITUTE OF TECHNOLOGY DHARWAD



॥ सा विद्या या विमुक्तये ॥

भारतीय प्रौद्योगिकी संस्थान धारवाड
Indian Institute of Technology Dharwad

Department of Chemistry

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

M.Sc. or equivalent degree in Chemistry.

The candidates must also fulfill ONE of the following additional requirements:

- Valid GATE Score.
- Junior Research Fellowship (JRF) of CSIR/UGC/DST INSPIRE or any other funding agencies.
- M.Phil or M.Tech./M.E. or equivalent degree in chemistry

B.2 Minimum score in the qualifying degree

1. For General/OBC category candidates and/or for candidates where no concession in academic performance is called for, the eligibility criteria in the qualifying degree is :
 - a minimum of 60% marks (without round off) in aggregate. (OR)
 - 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).
2. For SC/ST/PwD category candidates, a relaxation of 5% in the qualifying degree is applicable.

B.3 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 above considering

updated score in the qualifying degree. 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 Chemistry admits Ph.D. candidates under the full-time research scholarship - Teaching Assistantship (TA) and Fellowship Award (FA).

C.1 Teaching Assistantship (TA):

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 the financial support as per the MHRD norms.

1. For students with 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 ₹ 31,000 for the first 2 years and enhanced rate of ₹ 35,000/- for the remaining 3 years and HRA as per rules.
2. 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 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 ₹31,000/- for the first two years and enhanced rate of ₹35,000/- for the remaining period (HRA as per rules)
3. To get the 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.
4. The continuation of the assistantship will be subject to the satisfactory performance of the duties assigned by the Departments as well as satisfactory academic performance.
5. As per MHRD directives, the employees on the rolls (with or without pay) of any organization are not eligible for admission under this 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.
6. 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 Award (FA)

These students are financially supported under various Govt. / Semi Govt. schemes like CSIR, UGC, DAE, DST or DST INSPIRE etc. and some other organizations. The admission procedure and other requirements are same as applicable to TA.

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/-

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 ₹ 8 lakhs 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 screening test will begin on: **To be announced later online.**
3. Based on the performance in the online screening test, some of the candidates will be shortlisted for the written test.
4. Written test will begin on: **To be announced later online.**
5. Based on the performance in the written test, some of the candidates will be shortlisted for the interview.
6. Interviews will be held on: **To be announced later online.**
7. Very limited **accommodation/transportation may be facilitated** in the campus during the written test/interview. Details will be decided later and institute reserves the right to cancel the same at short notice depending upon the future circumstances.
8. Applicants should bring:
 - a. Photo ID card
 - b. Printed copy of the application
 - c. Degree certificate/s along with marks cards/aggregate percentage
 - d. Junior Research Fellowship offer letter from UGC/CSIR/INSPIRE fellowship or any other funding agencies
 - e. Valid GATE Score card
 - f. Date of Birth certificate
 - g. Thesis/dissertation/report of M.Tech./M.Phil or equivalent degree
 - h. Copy of certificates and mark sheets
 - i. Two passport size photographs
 - j. Scientific calculator

- k. Copy of publications (if any)
- l. Cast certificate/income certificate etc.

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 Multiple-Choice Questions (MCQ) type screening test followed by interview.
- Schedule for screening test and interview:

Screening test & Interview	Proposed Date of Written Test:	to be announced
	Duration & Proposed Timings of Written Test:	60 min
	Total Marks for the Written Test:	50
	Proposed Dates for Interview:	to be announced
	Total Marks for the Interview:	50
Total Marks		100

Candidates shortlisted based on the selection criteria are eligible to attend the screening test. Questions will be objective and will be based on the syllabus given in Section G. The candidate will be selected based on their performances on both the tests.

G. SYLLABUS

Syllabus for the written test

- Fundamental principles of chemistry
Recommended textbooks: J. Clayden, L. G. Wade, J. D. Lee and P. Atkins
- Organometallic chemistry: Metals aryls and alkyls, p-bound ligands etc, oxidative addition-reductive elimination, applications to organic chemistry
Recommended textbooks: R.H. Crabtree and BD Gupta and A. J. Elias
- Spectroscopy: Rotational, vibrational and electronic spectroscopy, NMR and mass spectrometry
Recommended textbooks: C. N. Banwell, D. L. Pavia and H. Gunther

- Organic name reactions: Reactions and their mechanisms
Recommended textbooks: W. Carruthers and J. Clayden
- Basic Bioorganic chemistry and Biochemistry: Biomolecules (proteins, carbohydrates, nucleic acids and fatty acids) and their chemistry, biomimetic chemistry, metabolic pathways, biosynthesis of biomolecules, enzymes mechanisms, metalloenzymes, central dogma of life, basic concepts of medicinal chemistry
Recommended textbooks: Voet and Voet, Lehninger, Hermann Dugas

H. RESEARCH TOPICS

The two research topics are broadly classified as given below. The applicant may be asked to indicate the choice of the research topics in the order of preference.

1. Organic chemistry of the enzyme catalysed reactions in antibiotic compounds:

Enzymes are nature's organic chemists that carry out remarkable chemical reactions, particularly in the synthesis of antibiotics and other important drug compounds. To study the enzyme reaction mechanisms, one requires sound knowledge of chemistry and biochemistry. One particular area of interest is the ribosomally synthesized and post-translationally modified (RiPP) peptide natural products which show unique antibiotic properties. In today's world, the emergence of antibiotic resistance in bacteria is proving to be a serious and increasing threat to human health. Therefore, discovery of new structural motifs with novel antibacterial targets exhibiting activity against multi-drug resistant pathogens is of utmost importance. RiPP natural products, produced by bacteria, are an emerging class of peptide derived compounds with diverse structural features exhibiting wide array of bioactivities ranging from antibacterial to anticancer properties. RiPP precursor peptides are direct ribosomal gene products that undergo various post-translational modifications (PTMs) by enzymes to synthesize the mature, structurally complex antibiotics. We would like to study the chemistry of the enzyme mechanisms (such as C-H activation, C-C bond formation, molecular rearrangement, amide bond activation etc.) involved in synthesizing these natural products. One class of enzymes involved is called radical S-Adenosylmethionine (rSAM) enzymes that contain [4Fe-4S] clusters and carry out fascinating transformations using organic radical mediated chemistry. Recently, they were shown to catalyze reactions via an organometallic (Fe-C) intermediate as well. We would employ interdisciplinary techniques from chemistry (synthetic organic chemistry, physical organic chemistry, spectroscopic techniques, inorganic chemistry and anaerobic techniques), biochemistry/chemical biology, protein chemistry, and molecular biology/microbiology during these studies and suitable collaborations (such as for protein crystallography, complex synthesis, EPR techniques, proteomics, and synthetic biology etc.) will be initiated to gain insights into the molecular details of these mechanisms. In addition, analog generation for medicinal chemistry, enzyme inhibitors development and structure-function elucidation of new compounds will also be undertaken in the future.

2. Tryptophan derived bioactive natural products: Investigation of the chemistry of the biosynthesis pathways, and elucidation of structure and function

Tryptophan, the most chemically complex and the least abundant of the 20 common proteinogenic amino acids, is a biosynthetic precursor to many complex microbial natural products (such as antibiotic pyrrolnitrin), which are promising scaffolds for drug discovery and development. The chemical features of tryptophan, including its ability to undergo chemistry at almost every atom makes it a unique biological precursor for the generation of chemical complexity. Recently it was discovered that tryptophan leads to the formation of a few novel anticancer compounds of highly functionalized alkaloid family which were shown to induce DNA single and double strand breaks and metal dependent DNA complex formation. Moreover, they also cause several chromosomal aberrations, and blocks the synthesis of DNA and RNA by inhibiting topoisomerase II. Our goal would be to study the chemistry of the biosynthetic machineries (synthesis by enzymes in a biological set up) of such natural products *in-vitro*, understand the fundamental principles of the complex organic/inorganic chemical reactions (they also involve metalloenzymes) and characterize the molecular details of these proteins using various techniques from chemistry (synthetic chemistry, bioorganic/bioinorganic and biophysical chemistry) and biology (protein biochemistry, bioinformatics, molecular and cell biology). This investigation will also enable us to create variants of such compounds as potential anticancer agents by using chemo-enzymatic methods. In addition, bioinformatics/genomics guided discovery and structural characterization of new microbial antibiotic/anticancer compounds, determination of mode of the action, and related structure-activity relationship studies will also be taken up in the future.

I. INFORMATION PERTAINING TO 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.