INDIAN INSTITUTE OF TECHNOLOGY DHARWAD

Department of Chemistry

Ph.D. Admissions Brochure

Autumn-2018

Eligibility Criterion:

1. M.Sc. or equivalent degree in Chemistry.
2. 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 **First Class,** as specified by the candidate's Institution/University. If the Institution/University does not specify the division/class, then one of the following will be considered as the eligibility criteria:
   - 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).
3. For SC/ST/PwD category candidates, a relaxation of 5% in the qualifying degree is applicable.
4. 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

Important dates:

Release of Advertisement	: 01-03-2018
Availability of online application form	: 01-03-2018
End date for filing application	: 10-06-2018
Announcement of Shortlisted Candidates	: 14-06-2018
Screening Test and Interview	: 06 and 07-07-2018
Announcement of Results	: 10-07-2018
Registration for course	: 20-07-2018

Selection Process:

The following are the important guidelines for the shortlisted candidates for the screening test and interview:

1. Shortlisted candidates should report at the institute on 06th of July, 2018 at 8 AM.
2. No accommodation will be provided in the campus during the written/interview
3. Candidates should bring:
    - Printed copy of the online submitted application,
    - Government issued photo id card,
    - Date of Birth certificate,
    - Degree certificate/s along with marks cards/aggregate percentage,
    - Junior Research Fellowship offer letter from UGC/CSIR/INSPIRE fellowship or any other funding agencies.
    - Valid GATE Score,
    - Cast certificate,
    - Income certificate, and
    - Scientific calculator

DO NOT's

- Mobiles are not allowed in the examination hall or onto the interview room
- Department's decision is the final regarding any disciplinary matters
- Institute doesn't take any responsibility of your luggage/items that you leave before entering the examination hall.

Screening Test:

- Schedule for screening test and interview:

Screening test & Interview	Proposed Date of Written Test:	**06-07-2018**
	Duration & Proposed Timings of Written Test:	60 min (9:00 to 10:00 AM)
	Total Marks for the Written Test:	50
	Proposed Dates for Interview:	**06 and 07-07-2018**
	Proposed Timings of Interview:	2:00 PM onwards
	Total Marks for the Interview:	50

- The selection process consists of Multiple Choice Questions (MCQ) type screening test followed by interview. The syllabus for the screening test is given below.

- **Document Verification:** Only for candidates short-listed for interview. Certificate required are
    - Printed copy of the online submitted application,
    - Government issued photo id card,
    - Date of Birth certificate,

- Degree certificate/s along with marks cards/aggregate percentage,
- Junior Research Fellowship offer letter from UGC/CSIR/INSPIRE fellowship or any other funding agencies,
- Valid GATE Score,
- Cast certificate,
- Income certificate etc.

Application Categories and Financial Support

The Department of Chemistry admits Ph.D. candidates under the full time research scholarship - Teaching Assistantship (TA) and Fellowship Award (FA).

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 financial support as per 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 ₹25,000 for the first 2 years and enhanced rate of ₹28,000/- for the remaining period.
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 ₹25,000/- for the first two years and enhanced rate of ₹28,000/- for the remaining period.
3. 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.
4. The continuation of the assistantship will be subject to satisfactory performance of the duties assigned by the Departments as well as satisfactory academic performance.
5. Employees on the rolls (with or without pay) of any organization are not eligible for admission under this category.

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. Students getting assistantships from the Institute may join projects sponsored by external agencies and obtain corresponding fellowships in lieu of TA ship.

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.

Research Topics:

Problem statements with brief description

1. π-Conjugated polycyclic aromatic hydrocarbons: NIR absorbing and emitting materials and Organic open shell biradical molecules

The electron delocalization along the polycyclic aromatic structure gives rise to interesting electronic and optical properties. With the discovery of graphene, the research on the PAHs have gained a new impetus with the prospect of its application in molecular electronics such as organic field effect transistors (OFETs), Organic light emitting diodes (OLEDs) and solar cells. Apart of the semiconducting device applications, PAHs have also been utilized extensively for the fluorescence based applications and sensors etc. Despite of high importance of PAHs in various fields, the highly π-conjugated systems suffer photo- and air-instability and often involves tedious synthesis. Therefore, developing new and stable PAHs with superior semiconducting properties and NIR absorbing/emitting properties via various simplified synthetic strategies as well as addressing the factors influencing the stability are of inevitable importance. In addition, organic open shell biradicals, a subclass of the above mentioned molecules are also of great interest in spintronic device applications and boosting the solar cell theoretical efficiency. Thus, our group is interested in developing photo- and air-stable π-conjugated organic systems and exploit their applications in organic materials.

2. π-Conjugated two-dimensional crystalline/amorphous organic porous polymers

Two-dimensional (2D) materials have received wide attention since the demonstration of high charge mobility in graphene, that is often named a discovery of the century in solid state physics. Despite its many remarkable properties, graphene is a zero-band gap polymer which makes its application in semiconducting devices difficult if not impossible and further any chemical modification of graphene introduces sp3 defects which break π-conjugation and thereby destroy the special electronic properties of the material. Therefore, the 2D conjugated polymers constructed of organic building blocks are envisaged to be potential alternative candidates to graphene in terms of introducing bandgap and ease of altering electronic topology. To date, several 2D π-conjugated polymers have been synthesized as crystalline covalent organic frameworks (COFs) or amorphous porous organic polymers. One general problem of all approaches is a lack of versatile building blocks (monomers) capable to maintain direct π-conjugations in several directions, and, as a result, very limited electron delocalization in the currently accessible 2D polymers. Thus, we would like to design and synthesis 2D-organic polymers which will have efficient two-dimensional electronic delocalization and evaluate the electronic properties of these materials.

Syllabus for the written test

Coordination chemistry, Organometallic chemistry, Photochemistry, Organic name reactions, Molecular spectroscopy.

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