

**Indian Institute of Technology Dharwad**



॥ सा विद्या या विमुक्तये ॥

**Information Brochure**

**M.S. Admissions**

(For Indian Nationals)

**Autumn Semester 2023-24**

**(Additional Round)**

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## **Section I**

# **General Information on Admission Process**

## A. SCHEDULE OF MASTER OF SCIENCE (M.S.) ADMISSION

Sr. No.	Description	Relevant dates*
1.	Applications open	19 <sup>th</sup> June 2023
2.	Last Date to apply online	30 <sup>th</sup> June 2023
3.	Announcement of shortlist of eligible candidates	1 <sup>st</sup> July 2023
4.	Interview Schedule	2 <sup>nd</sup> July 2023 to 9 <sup>th</sup> July 2023
5.	Declaration of provisional list of selected & waitlisted candidates	14 <sup>th</sup> July 2023
6.	Admission process for recommended candidates	14 <sup>th</sup> July 2023 to 19 <sup>th</sup> July 2023
7.	Admission for waitlisted candidates	20 <sup>th</sup> July 2023 onwards

**\*All deadlines are defined exactly to be at 5:00pm on the respective date.**

All potential candidates are requested to keep visiting the institute website regularly for updated information about the admission process. **Future updates regarding the admission process will be made available on the institute website under section Academics >> Admissions >> M.S.**

## B. APPLICATION CATEGORIES AND FINANCIAL SUPPORT

IIT Dharwad admits candidates for full time M.S. Programme, under Teaching Assistantship (TA), Financial Assistantship (JRF from UGC/CSIR NET, INSPIRE Fellowship etc.), CSR, Project Assistantship, and External (EX) schemes.

### B.1 Teaching Assistantship (TA)

Funded by MoE, 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 the MoE norms.

1. The assistantship is payable for a maximum duration of two and half years or till the date of defence whichever is earlier. At present, the monthly rate of assistantship is ₹12400.
2. To get the Teaching Assistantship stipend, 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 work per week.
3. 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.
4. As per MoE 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.
5. The reservation to various social categories is applicable as per GoI norms.

## **B.2 Financial and Project Assistantship**

Funded from projects sponsored by industries and government funding agencies. Under this category, candidates will be paid fellowship as per the rules & regulations of the governing project.

## **B.3 CSR**

Funded by corporates under the corporate social responsibility (CSR) scheme of the Government of India. The fellowship is payable for a duration as specified by the supporting organization for a particular project.

## **B.4 External (EX)**

The candidates employed in recognized R&D organizations and desirous of pursuing M.S. programme while continuing in employment may apply for admission as external candidates. After fulfilling the coursework requirement at the Institute, these candidates will be allowed to register for M.S. with a Supervisor (internal) from the Institute and a Co-supervisor (external) from their parent organization where they will be doing the research work. The admissions are based on the following norms:

1. The competence of these candidates will be assessed along with the regular candidates.
2. At the time of online application, the candidate should submit a Sponsorship Certificate (Appendix A) from the organization in which he/she is employed giving an undertaking that the candidate would be released from the normal duties to fulfil the coursework requirement (and qualifier examination, if applicable). The certificate should also provide details of the facilities in the organisation relevant to the research programme and that would be made available to the candidate for carrying out his/her thesis work.
3. The candidate is required to be at the Institute as a full-time student for the coursework (and qualifier examination, if applicable) of his/her M.S. Programme. The coursework requirement is likely to be a period of 1-2 semesters. Depending on the student's background and the programme requirements, an additional semester may be needed to complete the coursework/qualifier examination.
4. To promote interaction between the internal supervisor and external co-supervisor, meetings between them should be arranged at least once in a semester in the Institute or in the sponsoring organization.
5. The M.S. registration of an external candidate would be reviewed at the end of each semester from the date of registration in terms of his progress in courses/seminars/approved research programme by a Research Progress Committee (RPC) nominated by the concerned Department and approved by Academic Program Evaluation Committee (APEC).
6. The option of external registration is for applicants who are working in well-equipped scientific institutions, laboratories, R&D establishments and industrial organizations

engaged in research based activities. **Persons working in colleges/universities are NOT eligible under this category.**

7. At the time of joining the programme, the students will have to produce a “Relieving certificate” from his / her employer that he / she has been fully relieved from normal duties during the semester(s) to complete the course work and other academic work at IIT Dharwad.

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

### **C. APPLICATION PROCESS**

1. Please read all the instructions given in the brochure carefully before filing up the application form.
2. Please note that the application is to be filled at one go. There is no save and proceed option. The application process flow is given below.

Keep all the documents handy >> pay the application fee through SBI e-collect facility >> Note down SBI e collect reference No>> Start online application form>> Fill all particulars including SBI e collect reference No>> Take a print/ save a pdf copy of preview of completed application form >> Final submission of application form >> Note down submission ID for future reference

3. The procedure to pay the application fee through SBI e-collect facility is made available on the website and application form. Candidates are requested to pay the application fee through the steps/procedure described there. Candidates may contact [pgadmissions@iitdh.ac.in](mailto:pgadmissions@iitdh.ac.in) for any errors/issues pertaining to payment of application fees or for any clarifications regarding admission process.
4. This information brochure and future updates regarding the admission process will be made available on the institute website under section Academics >> Admissions >> MS.
5. **Application consists of 2 parts – Part 1 (Institute Form) and Part 2 (department specific form(s)). Each applicant is requested to submit both the forms. In case applicant wants to apply to multiple departments, (s)he should submit Part 2 of the application form for each of the respective departments.**
6. 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. Only after successful submission of the form, you should receive a confirmation email. In case you have not received any e-mail confirmation, within one hour after submission, you are requested to resubmit the form.
7. The application fee is as follows:

Gen/Gen (EWS)/OBC/ all other candidates	₹ 200/-
Women/SC/ST/PwD category candidates	₹ 100/-

8. **The Application Form without valid online payment details will not be considered. Application FEE is Non-Refundable.**

**Only one-time single application fee per applicant should be paid, irrespective of the number of the department the candidate is applying to. The link to make application fee payment is [State Bank Collect \(onlinesbi.sbi\)](https://onlinesbi.sbi). When you click on the link, choose “Application Fee (M.Tech/MS/PhD)”, fill all particulars, choose category and application fee amount as applicable to you and then submit. Note down the transaction reference number to be mentioned in the application form and for future reference.**

9. Applicants may find it convenient to keep following information handy while filling the application form online (whichever relevant):
  - Skype Id / Gmail Id for G-meet
  - Passport size photo whose size is less than 50 kb
  - Educational details from secondary school onwards
  - GATE qualification details
  - Statement of Purpose (pdf file)
  - Proof of application fee payment (pdf file)
  - List of fellowship/ awards
  - Publications and any other achievements/information.
10. Amendments to the form will not be possible once the last date to apply online is over. However, amendments can be considered if the applicant resubmits the entire form without making repeat fee payment before the deadline.
11. Check your emails regularly for any communication 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.
13. Candidates (if) called for written test / interview should bring with them Photo ID Card, Printed Copy of Online Application Form, Photocopies of Academic Transcripts, Degree Certificates & Experience Certificates, Caste Certificate (if applicable), PwD Certificate (if applicable), EWS Certificate (if applicable), Thesis/Dissertation/Report/Publications and all other relevant documents.
14. **Candidates should keep all their documents ready, they should produce the same when asked for within a short notice. The documents include all educational qualification, GATE score card, experience and category certificates etc.**

## D. FEES, DEPOSITS & HOSTEL RENT

### D.1 TA Category

The tentative fee applicable for admission to MS programme for Autumn 2023-24 is provided below for reference purpose. **The actual fee to be paid will be made available at the time of declaration of final results.**

S. No.	Fee Amount (In Rs.)	For General/EWS/OBC	For SC/ST/Divyangjan
<b>A. One-time payment at the time of Admission</b>			
1.	Admission Fee	2,200.00	2,200.00
2.	Thesis Fee	2,500.00	2,500.00
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	2,500.00	2,500.00
7.	Identity Card	500.00	500.00
8.	Convocation Fee	3000.00	3000.00
9.	Alumni Fee	1000.00	1000.00
<b>Sub-Total (A)</b>		<b>13,600.00</b>	<b>13,600.00</b>
<b>B. Semester Fee</b>			
^1.	Tuition Fee – Statutory Fee	2,500.00	Nil
2.	Examination Fee	1,000.00	1,000.00
3.	Registration Fee	750.00	750.00
4.	Gymkhana Fee	3,000.00	3,000.00
5.	Student Benevolent Fund	500.00	500.00
6.	Medical Fee	1,500.00	1,500.00
*7.	Hostel Room 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
<b>Sub-Total (B)</b>		<b>18,800.00</b>	<b>16,300.00</b>
<b>Mess Advance</b>		<b>24,500.00</b>	<b>24,500.00</b>
<b>C. Deposits (Refundable) to be paid at the time of Admission</b>			
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
<b>Sub-Total (C)</b>		<b>3,000.00</b>	<b>3,000.00</b>
<b>GRAND TOTAL FEE (A + B + C+ Mess Advance)</b>		<b>59,900.00</b>	<b>57,400.00</b>

#### Note:

- All the SC/ST/Divyangjan students are exempted from payment of Tuition fee.
- \*Students not staying in the campus or not provided married accommodation are not required to pay fee at sl. no. 7, 8, 9, 10 & Mess advance.**
- ^IIT Dharwad reserves the right to revise the Tuition Fee-Statutory Fee (in future).



## D.2 Project/External/FA/Other categories

The tentative fee applicable for admission to MS programme for Autumn 2023-24 is provided below for reference purpose. **The actual fee to be paid will be made available at the time of declaration of final results.**

S. No.	Fee Amount (In Rs.)	For General/EWS/OBC	For SC/ST/Divyangjan
<b>A. One-time payment at the time of Admission</b>			
1.	Admission Fee	2,200.00	2,200.00
2.	Thesis Fee	2,500.00	2,500.00
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	2,500.00	2,500.00
7.	Identity Card	500.00	500.00
8.	Convocation Fee	3000.00	3000.00
9.	Alumni Fee	1000.00	1000.00
<b>Sub-Total (A)</b>		<b>13,600.00</b>	<b>13,600.00</b>
<b>B. Semester Fee</b>			
^1.	Tuition Fee – Statutory Fee	25,000.00	Nil
2.	Examination Fee	1,000.00	1,000.00
3.	Registration Fee	750.00	750.00
4.	Gymkhana Fee	3,000.00	3,000.00
5.	Student Benevolent Fund	500.00	500.00
6.	Medical Fee	1,500.00	1,500.00
*7.	Hostel Room 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
<b>Sub-Total (B)</b>		<b>41,300.00</b>	<b>16,300.00</b>
<b>Mess Advance</b>		<b>24,500.00</b>	<b>24,500.00</b>
<b>C. Deposits (Refundable) to be paid at the time of Admission</b>			
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
<b>Sub-Total (C)</b>		<b>3,000.00</b>	<b>3,000.00</b>
<b>GRAND TOTAL FEE (A + B + C+ Mess Advance)</b>		<b>82,400.00</b>	<b>57,400.00</b>

### Note:

- All the SC/ST/Divyangjan students are exempted from payment of Tuition fee.
- \*Students not staying in the campus or not provided married accommodation are not required to pay fee at sl. no. 7, 8, 9, 10 & Mess advance.**
- ^IIT Dharwad reserves the right to revise the Tuition Fee-Statutory Fee (in future).

## E. INFORMATION PERTAINING TO HOSTELS

About IIT Dharwad	Kindly visit the website <a href="https://www.iitdh.ac.in/">https://www.iitdh.ac.in/</a> for available facilities
Hostel Room Allocation (on sharing basis)	You will be allotted a room in the hostel & the room key will be handed over on your arrival at the Institute. Each room will accommodate roughly two/four students (depending on the prevailing conditions) and has an attached bath & toilet.
Are hostel rooms furnished	Each student will be provided a cot, chair & study table and wardrobe. Students can purchase mattress/bedding, bucket, etc. locally. Arrangements will be made for on-campus shopping for these items.
Possession of motorized vehicle	NOT ALLOWED, however bicycles are permitted in the campus.
Climatic conditions	The weather at Dharwad is pleasant throughout the year. Generally, it will be raining in the months of June to September and weather will be windy and cold during the months of October to January. It is suggested that you carry protective clothing accordingly.

## **Section II**

### **Department Specific Information**

## **F. DEPARTMENT OF ELECTRICAL ENGINEERING**

### **F1. Eligibility for Admission**

#### **F.1.a. General Criteria**

1. B. Tech / B. E. or equivalent degree in Electrical Engineering, Electronics and Communication Engineering, Electrical and Electronics Engineering, Instrumentation Engineering or any related stream.
2. A valid GATE score in relevant stream\*

\*Valid GATE score is essential for candidates (applying in both TA and PA categories) (except for candidates who have B.Tech. or equivalent degree from IITs or BS degree from IISc with minimum CPI/CGPA of 8.0 on the scale of 10).

#### **F.1.b. Minimum score in the qualifying degree**

**For General/General (EWS)/OBC category candidates and/or for candidates where no concession in academic performance is called for, the eligibility criteria in the qualifying degree (B.Tech./B.E.) is either:**

1. a minimum of 60% marks (without round off) in aggregate over the entire duration of the undergraduate program.
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).

**For SC/ST/PwD category candidates, a relaxation of 5% (or CPI/CGPA of 0.5 on the scale of 0-10) in the performance at the qualifying degree is applicable.**

*Note that merely satisfying the eligibility conditions does not guarantee selection into the programme.*

#### **F.1.c. Applicants in the final phase of getting 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 2023-24 semester of IIT Dharwad are also eligible to apply. However, if offered, the admission to those candidates would be provisional. To join an 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 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.

#### **F.2. Financial support category**

The Department of Electrical Engineering admits candidates for full time M.S. Programme, under Teaching Assistantship (TA) and Project Assistantship (PA) category only.

### F.3. Research Areas for TA category

The research areas are broadly classified in four streams as described below. **The applicant MUST indicate the choice of the research topics in an order of preference.**

**A. Microelectronics and VLSI:** Including but not limited to, Analog / Mixed signal / RF Integrated Circuits and Systems, High speed circuits, instrumentation circuits, Power management and Energy harvesting circuits etc.

**Electronic Devices:** Including but not limited to Gas sensors, Nano-electronics. GaN-based HEMTs, Silicon Carbide Power Diodes and Semiconductor Radiation Detectors.

**B. Power & Energy Systems:**

Power Systems: Power system stability and control; Smart Grid; Micro grids; Impact of renewables, battery energy storage and Electric Vehicles on Grid; Cyber Security and Game Theory Applications in Smart Grid.

Power Electronics: Converters and Controls: DC/DC and DC/AC converters for applications in Electric Vehicles; Power Electronics and converters for Renewable Energy; Medium voltage hybrid DC circuit breakers; Grid connected multilevel inverters; high voltage power electronics and control; Electrical drives for Electrical Vehicles; Design of Converters with Wide-Bandgap devices (GaN and SiC); Design and implementation of Embedded Controllers (DSP, FPGA, Microcontrollers) for intelligent power converters

**C. Communications/signal processing:** Wireless communication, wireless networks, caching in cellular networks, machine learning for wireless communication/networks, federated learning with communication constraints, Satellite Communications, Underwater communications, theoretical aspects of learning over wireless networks. Speech, language and audio processing.

**D. Signal Processing and Machine Learning :** Machine learning for signal processing, Deep Learning for signal processing, speech and natural language processing, biomedical signal and image processing and optical character recognition, handwriting recognition and document processing, bioinformatics.

**E. Control and Robotics:** Including but not limited to Control of Robots through Speech Signals, Autonomous Vehicles, Control for Differential Games, Control of Structures etc.

### F.3. Research Areas for PA category

1. Analog and mixed VLSI
2. Power and energy systems
3. Communications
4. Signal processing and Machine learning

Note: Candidates should fill the form only once and clearly indicate preferred area of research. If any candidate fills the form multiple times, only the latest one will be considered.

#### **F.4. Selection process**

All the eligible candidates will be invited for the interviews via video conferencing. The interview slot (date and starting time) specific to each candidate will be communicated online at [https://www.iitdh.ac.in/academics\\_ms.php](https://www.iitdh.ac.in/academics_ms.php).

Syllabus for the interview is given in Section G.4.1 of this document.

Selection committee decision is final in all matters including any disciplinary matters/malpractice.

##### **F.4.1. Syllabus – Electrical Engineering**

**Engineering Mathematics:** Linear Algebra: Matrix Algebra, Systems of linear equations, eigenvalues, and eigenvectors. Transform Theory: Fourier Transform, Laplace Transform, basic probability.

**Electric Circuits:** KCL, KVL, Transient response of dc and ac networks, Sinusoidal steady-state analysis, filters, Ideal current and voltage sources, Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum power transfer theorem, Three phase circuits, Power and power factor in ac circuits.

**Electronic Devices and Circuits:** Energy bands in intrinsic and extrinsic semiconductors, equilibrium carrier concentration, direct and indirect band-gap semiconductors. Carrier transport: diffusion current, drift current, mobility and resistivity, generation and recombination of carriers, Poisson, and continuity equations. P-N junction, Zener diode, BJT, MOS capacitor, MOSFET, LED, photodiode, and solar cell.

**Signals and Systems:** Representation of continuous and discrete-time signals, Shifting and scaling operations, Linear Time Invariant and Causal systems, Fourier series representation of continuous periodic signals, Fourier transform etc.

**Analog Electronics:** Characteristics of diodes, transistors; Simple diode circuits; Amplifiers; Operational amplifiers: Characteristics and applications.

**Control Systems:** Basic control system components; Feedback principle; Transfer functions; root locus

**Magnetic Circuits:** Inductor; Transformers - Single phase transformer: equivalent circuit, phasor diagram, open circuit and short circuit tests, regulation and efficiency.

#### **F.5. Department level contacts for admission process enquiries**

For queries related to MS admissions in EE Department, one can write to [pgadmissions.ee@iitdh.ac.in](mailto:pgadmissions.ee@iitdh.ac.in) and cc to [pgadmissions@iitdh.ac.in](mailto:pgadmissions@iitdh.ac.in) with the subject "Query related to MS Admissions in EE".

## **G. DEPARTMENT OF MECHANICAL, MATERIALS AND AEROSPACE ENGINEERING**

### **G.1. ELIGIBILITY FOR ADMISSION AT MMAE IIT DHARWAD**

#### **G.1.a. General Criteria**

1. B.Tech. /B.E. or equivalent degree in Mechanical Engineering or Materials and Metallurgical Engineering or Aerospace Engineering or other related streams.
2. A valid GATE score in one of the following papers AE, ME, MT, PI, XE (A, B, C, D, E)\*

\*Valid GATE score is essential for candidates applying in TA category (except for candidates who have B.Tech. or equivalent degree from IITs or BS degree from IISc with minimum CPI/CGPA of 8.0 on the scale of 10).

#### **G.1.b. Minimum score in the qualifying degree**

For General/General (EWS)/OBC category candidates and/or for candidates where no concession in academic performance is called for, the eligibility criteria in the qualifying degree (B.Tech./B.E.) is either of the following two:

- A minimum of 60% marks (without round off) in aggregate over the entire duration of the undergraduate program.
- 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 0-10 (for example, 4.8 on a scale of 0-8).

**For SC/ST/PWD category candidates, a relaxation of 5% in the performance at the qualifying degree is applicable.**

#### **G.1.c. GATE score**

Minimum GATE score requirement is 350 for General/EWS, 315 for OBC (NCL), 233 for SC/ST/PWD.

***Merely satisfying the eligibility conditions does not guarantee selection into the program.***

### **G.2. Applicants in the final phase of getting qualifying degree**

The students who are in the final phase of receiving above mentioned qualifying degree and are likely to graduate before the commencement of the Autumn 2023-24 semester are also eligible to apply. However, if offered, the admission to those candidates would be provisional. To join the academic program at IIT Dharwad, such candidates need to furnish necessary documents regarding completion of the degree on the date of joining IIT

Dharwad. The date of joining will be announced later on the Institute website. The candidate needs to meet the criteria specified in section [G.1. ELIGIBILITY FOR ADMISSION AT MMAE IIT DHARWAD](#) above considering the 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 the same should be reported in the online application.

### **G.3. Financial support category**

The Department of Mechanical, Materials and Aerospace Engineering at IIT Dharwad invites applications for the MS program under the following categories *only* for the Autumn Semester 2023-24:

- a) TA (Teaching Assistantship)
- b) PA (Project Assistantship)

### **G.4. Information on project category**

The following projects are seeking MS scholars in the project category:

a) **Position Code:** 23Au\_MMAE\_MS\_PA01

**Broad area of research:** Metallic Additive Manufacturing (AM), Functionally Gradient Objects, Hybrid Directed Energy Deposition

**Stipend:** The proposed stipend Rs. 31,000/- per month + 16% HRA if the hostel facility is not available.

**Duration of the funding:** 20 months (student may opt for TA position if required in case project funding is over before graduation)

**Number of openings:** 1

**Project Title:** Development of Functionally Gradient Components via. Hybrid Directed Energy Deposition based Additive Manufacturing

**Brief Description:**

Directed Energy Deposition (DED), one of the classifications of AM technology, is markedly suitable for large-scale structural, gradient objects and bulk volume components with deposition rates as high as 600 cm<sup>3</sup>/hr. Directed Energy Deposition process is deposition of powder or wire on substrate and simultaneously fused using laser and plasma. This project is focused on Design and Development of Hybrid Laser powder and wire arc directed energy deposition (DED) system for fabrications of functionally gradient objects with small and medium. Which includes not limited to design, parametric study, material and alloy selection for tailored design, computational modelling of gradient.



**b) Position Code: 23Au\_MMAE\_MS\_PA02**

**Broad area of research:** Electric Assisted Forming, Material Characterization

**Stipend:** Rs. 31,000/- per month + 16% HRA if the hostel facility is not available

Number of openings: 01

**Duration of the funding:** 15 months (student may opt for TA position if required in case project funding is over before graduation)

**Project Title:** Microstructure Evolution and Mechanical Behaviour during Electric Assisted Forming in HCP materials

**Brief Description:** Materials like Titanium and Magnesium alloys are difficult form at room temperature. High temperature forming is expensive and causes oxidation problems. An alternative to overcome these challenges is to give electric shock during deformation which enhances the formability. This project aims to design and develop a mechanism for localized processing of material using electric assistance and studying the effects on the material properties.

**Expected scope of the project:** Designing machine for localized forming / processing, Finite Element Analysis using Abaqus or ANSYS, microstructural analysis, characterization of mechanical properties.

**c) Position Code: 23Au\_MMAE\_MS\_PA03**

**Broad area of research:** 4D printing

**Stipend:** Rs. 31,000/- per month + 16% HRA if the hostel facility is not available

Number of openings: 01

**Duration of the funding:** 24 months (student may opt for TA position if required in case project funding is over before graduation)

**Project Title:** Design and development of shape memory polymer based 4D printing technology for programmable actuation applications

**Brief Description:** The current proposal majorly focuses on the development of SMP/SMPCs based 4D printed parts, that are used in various targeted applications. For building customized 4D printed parts, there is need for an integral setup involving fused based deposition and resin-curable 3D printers used in the process of embedding/integrating flexible heating circuitry and reinforcements in the 4D printing products. To predict the behavioural changes of SMP/SMPCs based 4D printed gradient parts, a numerical model is required to be developed (with the aid of ANSYS/COMSOL simulation tool) that can also be used to validate the experimental results. After the cognizance of the overall process (using single polymer), multi-material (using two or more polymer materials) gradient parts can be built in a programmable manner to accomplish multi-functionality nature. Finally, the products can be catered to demands of end users. This holistic approach and proposed methodology play a major role in the development of multi-functional parts, that greatly helps different sectors like medical, aerospace and electronics industries with produced 4D printed dynamic parts.

d) **Position Code:** 23Au\_MMAE\_MS\_PA04

**Broad area of research:**

**Stipend:** Rs. 31,000/- per month + 16% HRA if the hostel facility is not available

**Number of openings:** 01

**Duration of the funding:** 18 months (student may opt for TA position if required in case project funding is over before graduation)

**Project Title:** Fruit quality assessment using depth imaging augmented by conventional RGB imaging

**Brief Description:** Unbiased and consistent assessment of the food produce can be facilitated using Computer Vision techniques. While Image based techniques have been explored earlier, those being a 2D projection of an actual 3D scene, can't capture physical dimensions and 3D information precisely. Here we are proposing to use depth information of the scene i.e. morphology of the sample such as Apples, Grapes to classify in appropriate category.

**Expected scope of the project:** Programming and working with various sensors, embedded systems such as Arduino/RaspoberryPi/Jetson/Nano and SDKs, use of Machine learning and Deep learning techniques.

e) **Position Code:** 23Au\_MMAE\_MS\_PA05

**Broad area of research:** Fluid mechanics

**Stipend:** Rs. 31,000/- per month + 16% HRA if the hostel facility is not available

**Number of openings:** 01

**Duration of the funding:** 18 months (student may opt for TA position if required in case project funding is over before graduation)

**Project Title:** Suspension of Pre-heated Particles and their Interactions in non-Newtonian Fluids for Industrial Processes

### G.5. Modality of Selection Process

Shortlisting of applications will be done according to the criterion given in **G.1** and **G.2**. The eligible candidates will be interviewed as mentioned below.

- For the TA category:  
Candidates will go through an online interview round. The details of the interview round will be communicated to the shortlisted candidates.
- GATE is not mandatory for the candidates who have B.Tech. or equivalent degree from IITs or BS degree from IISc with minimum CPI/CGPA of 8.0 on the scale of 0-10; for those candidates, the selection will be based on CPI/CGPA only. Up to 10% of the total seats can be filled from this category.
- Those who opt for the PA category will also go through an online interview round. The details of the interview round will be communicated to the shortlisted

candidates.

The candidates are encouraged to check the institute website from time to time for the results. Selection committee decisions are final in all matters. Please note that the selection process may not exactly match what is mentioned in section A.

### **G.6. Dos and Don'ts during online interview**

#### **Dos:**

- We recommend to try out a mock call session before the actual interview to ensure the audio-video set up is ready.
- Please plan to have at least 2GB of data with you before the meeting. Also, try to locate yourself in a place with good internet speed (at least 1.5Mbps) for a good quality video interaction. Laptops/tablets are preferred for video conferencing.
- Have paper and pen or pencil calculators handy for any rough work.
- Keeping a glass of water ready may be a good idea.
- Ensure that equipment is charged to avoid power issues.
- Ensure that the place from where you are attending the interview is conducive for effective interaction online.
- Best Practices while in online meetings:
- Sign in to the online client (Google Meet App/Desktop) 10-15 minutes ahead of scheduled meeting time and stay signed in
- Turn your camera on and have your camera at the eye level
- Stay muted unless you're talking to reduce background noise
- Make sure you sit in a well-lit and quiet place
- Be mindful of what's going on behind you. Think about having a solid wall/nice curtain behind you or turning on the virtual background (if available).

#### **Don'ts:**

- Do not record interviews in any form. Any such act will be considered as violation of the pledge you signed online and may invite punitive action from IIT Dharwad
- Avoid windy noisy surroundings during interview
- Do not ask about the schedule of the results. It is better to use interview time for other better inquiries as the results will be declared online as soon as possible.
- Do not leave your place in front of the camera for the entire duration of the interview.
- Prepare yourself to avoid any kind of break during interview, including restroom-break
- Do not have anyone else around you. Any interaction with someone else other than the interview panel during the interview will be considered as a suspicious activity.

**Note** - For any matter related to the selection process, the decision of the selection committee would be considered as the final decision

### **G.7 Focus area of research**

Department of MMAE, IIT Dharwad is looking for MS students in the following broad research areas. Applicant should be interested in at least one of the following research areas.

- **Thermal and Fluids Stream:** Atomization and sprays, Computational fluid dynamics, Fire dynamics, Multiphase flows, Turbomachinery aerodynamics, Combustion and Thermoacoustics, Dynamics of thin films
- **Design Stream:** Fracture mechanics, Finite Element Analysis, Biomechanics, Multibody kinematics and dynamics, Tribology, Computer vision and augmented reality, Reduced order modeling
- **Manufacturing and Materials Stream:** Metal forming, Additive manufacturing, Computational Materials Design, Physical and Mechanical Metallurgy, Digital Twins, Structural Materials for Aerospace and Automobile

For more details on the tentative research topics, please click on the following link

[Tentative research topics in the Department of MMAE, IIT Dharwad](#)

## G.8 Syllabus for interview

### Engineering Mathematics:

- **Linear Algebra:** Matrix algebra, systems of linear equations, eigenvalues and eigenvectors.
- **Calculus:** Functions of single variable, limit, continuity and differentiability, mean value theorems, evaluation of definite and improper integrals; double and triple integrals; partial derivatives, total derivative, Taylor series (in one and two variables), maxima and minima, Fourier series; gradient, divergence and curl, vector identities, line, surface and volume integrals, applications of Gauss, Stokes and Green's theorems.
- **Differential equations:** First order equations (linear and nonlinear); higher order linear differential equations with constant coefficients; Euler-Cauchy equation; initial and boundary value problems; heat, wave and Laplace's equations.
- **Complex variables:** Analytic functions; Cauchy-Riemann equations; Cauchy's integral theorem and integral formula.
- **Probability and Statistics:** Definitions of probability, Sampling theorem, conditional probability; mean, median, mode and standard deviation; random variables, binomial, Poisson and normal distributions.
- **Numerical Methods:** Numerical solutions of linear and non-linear algebraic equations; integration by trapezoidal and Simpson's rules.

### Analytical reasoning

- **Verbal reasoning:** reading comprehension, drawing inferences based on multiple facts stated in short paragraph.
- **Non-verbal reasoning:** inductive, logical, abstract, diagrammatic and spatial reasoning.

### Mechanical Design

- **Engineering Mechanics:** Free-body diagrams and equilibrium; trusses and frames; virtual work; kinematics and dynamics of particles and of rigid bodies in plane motion; collisions.
- **Mechanics of Materials:** Stress and strain, elastic constants, Poisson's ratio; Mohr's circle for plane stress and plane strain; thin cylinders; shear force and bending moment diagrams; bending and shear stresses; deflection of beams; torsion of circular shafts;

Euler's theory of columns; energy methods; thermal stresses; strain gauges and rosettes; testing of hardness and impact strength.

- **Theory of Machines:** Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of linkages; cams; gears and gear trains; flywheels and governors; balancing of reciprocating and rotating masses.
- **Vibrations:** Free and forced vibration of single degree of freedom systems, effect of damping; resonance; critical speeds of shafts.
- **Machine Design:** Design for static and dynamic loading; failure theories; fatigue strength and the S-N diagram; principles of the design of machine elements such as bolted, riveted and welded joints; shafts, gears, rolling and sliding contact bearings, springs.

### **Fluid and Thermal sciences**

- **Fluid Mechanics:** Fluid properties; fluid statics, manometry, buoyancy, forces on submerged bodies, stability of floating bodies; control-volume analysis of mass, momentum and energy; fluid acceleration; Bernoulli's equation; dimensional analysis; viscous flow of incompressible fluids, boundary layer, elementary turbulent flow, flow through pipes, head losses in pipes and bends, flow in convergent-divergent channels.
- **Heat-Transfer:** Modes of heat transfer; one dimensional heat conduction, resistance concept and electrical analogy, heat transfer through fins; lumped parameter system, thermal boundary layer, dimensionless parameters in free and forced convective heat transfer, heat exchanger performance, LMTD and NTU methods; radiative heat transfer, Stefan- Boltzmann law, Wien's displacement law.
- **Thermodynamics:** Thermodynamic systems and processes; properties of pure substances, behaviour of ideal and real gases; zeroth and first laws of thermodynamics, calculation of work and heat in various processes; second law of thermodynamics; thermodynamic property charts and tables, availability and irreversibility; thermodynamic relations.
- **Applications Power Engineering:** Air and gas compressors; vapour and gas power cycles, concepts of regeneration and reheat. I.C. Engines: Air-standard Otto, Diesel and dual cycles. Refrigeration and air-conditioning: Vapour and gas refrigeration and heat pump cycles; psychrometric chart, basic psychrometric processes.
- **Turbomachinery:** Impulse and reaction principles, velocity diagrams, Pelton-wheel, Francis and Kaplan turbines.

### **Manufacturing Science**

- **Engineering Materials:** Structure and properties of engineering materials, phase diagrams, heat treatment, stress-strain diagrams for engineering materials.
- **Forming, Joining and Casting Processes:** Plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk (forging, rolling, extrusion, drawing) and sheet (shearing, deep drawing, bending) metal forming processes; principles of powder metallurgy. Principles of welding, brazing, soldering and adhesive bonding. Different types of castings, design of patterns, moulds and cores; solidification and cooling; riser and gating design.
- **Machining and Machine Tool Operations:** Mechanics of machining; basic machine tools; single and multi-point cutting tools, tool geometry and materials, tool life and wear; economics of machining; principles of non-traditional machining processes; principles of work holding, jigs and fixtures; abrasive machining processes; NC/CNC machines and

CNC programming.

- Metrology and Inspection: Limits, fits and tolerances; linear and angular measurements; comparators; interferometry; form and finish measurement; alignment and testing methods; tolerance analysis in manufacturing and assembly; concepts of coordinate-measuring machine (CMM).
- Computer Integrated Manufacturing: Basic concepts of CAD/CAM and their integration tools; additive manufacturing.

### **G.9. Department level contacts for admission process enquiries**

For queries related to MS admissions in MMAE Department, one can write to [pgadmissions.me@iitdh.ac.in](mailto:pgadmissions.me@iitdh.ac.in) and cc to [pgadmissions@iitdh.ac.in](mailto:pgadmissions@iitdh.ac.in) with the subject “Query related to MS Admissions in MMAE”.

**H. Appendix A: Sponsorship Certificate for M.S External Registration (EX)**

(To be typed on letterhead of the Sponsoring Organization)

Name of the applicant:

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Name of the sponsoring organization:

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Address:

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Present Designation of the applicant:

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

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Division where research work is proposed to be done:

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Name of supervisor from the sponsoring organization:

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(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.

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**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 M.S. 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 M.S. thesis, along with a faculty member of IIT Dharwad as the Supervisor.

Date:

Signature and Seal of the Sponsoring Authority

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