

**INDIAN INSTITUTE OF TECHNOLOGY DHARWAD**



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**Information Brochure**

**M.S. Admissions**

(For Indian Nationals)

**Spring Semester 2023-24**

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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	13/10/2023
2.	Last Date to apply online	6/11/2023 <b>last date extended to 9/11/2023</b>
3.	Announcement of shortlist of eligible candidates	13/11/2023 onwards
4.	Examination/Interview Schedule	14/11/2023 to 2/12/2023
5.	Declaration of provisional list of selected & waitlisted candidates	12/12/2023
6.	Admission process for recommended candidates	Till 18/12/2023
7.	Admission for waitlisted candidates	19/12/2023 to 27/12/2023

**\*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. . Candidates are advised to keep visiting the website at regular intervals for all updated information regarding admission process.**

## 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 ₹12,400/-.
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. The latest application will be considered for scrutiny.**

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. **It is candidate’s responsibility to be aware about the schedule of various events related to the admission process.**

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 is provided below for **reference purpose only. The actual fee to be paid will be made available at the time of declaration of 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.	Modernization & 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
10	Graduation Transcript Fee	500.00	500.00
<b>Sub-Total (A)</b>		<b>14,100.00</b>	<b>14,100.00</b>
<b>B. Semester Fee</b>			
^1.	Tuition Fee - Statutory Fee	5,000.00	Nil
2.	Examination Fee	1,000.00	1,000.00
3.	Registration Fee	750.00	750.00
4.	Gymkhana Fee	5,000.00	5,000.00
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>23,300.00</b>	<b>18,300.00</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>64,900.00</b>	<b>59,400.00</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 is provided below for **reference purpose only. 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.	Modernization & 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
10.	Graduation Transcript Fee	500.00	500.00
<b>Sub-Total (A)</b>		<b>14,100.00</b>	<b>14,100.00</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	5,000.00	5,000.00
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>43,300.00</b>	<b>18,300.00</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>84,900.00</b>	<b>59,900.00</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 COMPUTER SCIENCE AND ENGINEERING**

### **F.1. Eligibility for Admission**

#### **F.1.a. Qualifying Degree**

i. B. Tech / B. E. in Computer Science and Engineering

**OR**

ii. Any B. Tech / B. E. in allied Engineering branches

**OR**

iii. Master of Computer Applications (MCA)

**OR**

iv. MSc in Computer Science

A valid GATE score in Computer Science and Engineering\*

\*Valid GATE score is essential for candidates applying in TA and PA 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). *GATE score is not mandatory for the EX category.*

#### **F.1.b. Minimum eligibility criteria**

##### **F.1.b.1 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).
3. Candidates with MSc in Computer Science have eligibility criteria of a minimum of 60% marks in both BSc in Computer Science and MSc in Computer Science.
4. Candidates with MCA have eligibility criteria of a minimum of 60% marks in both BCA and MCA.
5. For SC/ST/PwD category candidates, a relaxation of 5% in the performance at the qualifying degree is applicable.

##### **F.1.b.2 Minimum score in GATE**

For General/General (EWS) category candidates and/or for candidates where no concession in academic performance is called for, **the eligibility requirement in the GATE score is a soft-cutoff of 500. And for other categories, relaxation is given as per GOI norms.**

*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 Spring 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 in section 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 Dept. of Computer Science and Engineering at IIT dhArwAD invites application for the MS programme under the following categories only for the Spring 2023-24 semester –

**a) TA:** In this call, applications are invited under TA category only for research areas (1)-(6) as mentioned in Section F.4. The applicant may be asked to indicate the choice of the research topics in the order of preference.

**b) EX: Please note that ONLY** 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. **College Teachers and regular candidates are NOT eligible to apply under EX category.** (Refer section B.4, page 6 for more details)

**c) Project Assistantship (PA):**

**Code: SP23\_CSE-01**

**Title: Robustness and reliability of NN based Advanced Driver Assistance System (ADAS) Workloads**

**Description:** This project involves understanding of ADAS workloads, implementation of the same on edge computing hardware like (GPU, TPU, NPU) using various NN frameworks like TensorRT, TVM etc and assessing the performance, adversarial robustness and other related metrics like accuracy etc.

**Requirement:** The candidate should have exposure to the basics of Neural networks particularly in the context of Image classification and Object detection, hands on experience with high level NN frameworks like Pytorch, Tensorflow and DNN compilers like TensorRT, TVM, etc . The candidate should have good programming skills in C/C++ and Python.

**Type of funding support – PA (Rs. 15000/-)**

**Duration of funding: 2.5 years**

**Number of openings: 1**

### F.3 Modality of selection process

Only the eligible applicants are permitted to participate in the selection process. The tests and interviews will be based on the topics listed in Section F.5. The selection process would involve two rounds. Round-1 will be an online interview to test the aptitude, programming skills, knowledge of Discrete Structures and Data Structures and Algorithms of the candidate. In round-2, the candidates shortlisted from round-1 will be called for an interview (online) by the respective panel based on the research area preference mentioned in the admission form. The candidates are encouraged to check the Institute Website ([https://www.iitdh.ac.in/academics\\_ms.php](https://www.iitdh.ac.in/academics_ms.php)) from time to time. Selection committee decisions are final in all matters including any disciplinary matters/malpractice.

### F.4. Focus area of research

The research topics are broadly classified as given below.

- 1. Data Science and Artificial Intelligence (DSAI):** Machine Learning (ML), Deep Learning (DL), Reinforcement Learning (RL), Stochastic Control and Optimisation, Bayesian Optimization, Text Mining, Speech and Audio Processing, Handwriting and Document Processing, Natural Language Processing, ML for Cyber Physical Systems, Mining large data streams, ML for Cyber Security, Machine learning for Speech and Vision Big Data Analytics, Distributed data processing.
- 2. Computer/Communication Networks (CN):** 5G/IoT Networks, AI Driven Networking, Network Virtualization, Network/Cyber Security, Blockchains, Software Defined Networks, Network Function Virtualization, Data Center Networking
- 3. Embedded systems and Computer Architecture (ESCA):** Reliability and robustness of Advanced driver assistance systems (ADAS), Modeling and characterization of heterogeneous processors, Runtime Verification, and Efficient Computer Architectures.
- 4. Systems for Artificial Intelligence/Machine learning (SysML) :** Application of neural networks on Edge devices, Hardware for Machine Learning Systems: GPU, CPU, TPU, NPU, ML Systems and Software Stack, ML Compilers, Quantized and Low-precision Machine Learning.
- 5. Theoretical Computer Science (TCS):** Algorithms, Logic, Concurrency, Formal Verification, and Graph Theory.
- 6. High Performance Computing and Programming Languages (HPCPL):** Parallel Computing, Compilers and Translation Systems, Programming models and runtime systems.

### F.5. Syllabus – Computer Science and Engineering

- **Discrete Structures:** Propositional and first order logic. Sets, relations, functions, partial orders and lattices. Groups. Graphs: connectivity, matching, coloring. Combinatorics: counting, recurrence relations, generating functions. Linear Algebra: Matrices, determinants, system of linear equations, eigenvalues and eigenvectors, LU decomposition Calculus: Limits, continuity and differentiability. Maxima and minima. Mean value theorem. Integration. Probability: Random variables. Uniform, normal, exponential, poisson and binomial distributions. Mean, median, mode and standard deviation. Conditional probability and Bayes theorem.
- **Digital Logic:** Boolean algebra. Combinational and sequential circuits. Minimization. Number representations and computer arithmetic (fixed and floating point).

- **Computer Organization and Architecture:** Instruction set Architecture, Machine instructions and addressing modes. ALU, data-path and control unit. Instruction pipelining. Memory hierarchy: cache, main memory and secondary storage; I/O interface (interrupt and DMA mode).
- **Programming and Data Structures**  
Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs.
- **Algorithms**  
Searching, sorting, hashing. Asymptotic worst case time and space complexity. Algorithm design techniques: greedy, dynamic programming and divide-and-conquer. Graph search, minimum spanning trees, shortest paths.
- **Theory of Computation**  
Regular expressions and finite automata. Context-free grammars and push-down automata. Regular and context-free languages, pumping lemma. Turing machines and undecidability.
- **Compiler Design**  
Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation.
- **Operating Systems**  
Processes, threads, inter-process communication, concurrency and synchronization. Deadlock. CPU scheduling. Memory management and virtual memory. File systems.
- **Databases**  
ER-model. Relational model: relational algebra, tuple calculus, SQL. Integrity constraints, normal forms. File organization, indexing (e.g., B and B+ trees). Transactions and concurrency control.
- **Machine Learning and Artificial Intelligence:** Optimization, Neural Nets, and Learning Theory, Regression, Classification
- **Computer Networks**  
Concept of layering. LAN technologies (Ethernet). Flow and error control techniques, switching. IPv4/IPv6, routers and routing algorithms (distance vector, link state). TCP/UDP and sockets, congestion control. Application layer protocols (DNS, SMTP, POP, FTP, HTTP). Basics of Wi-Fi. Network security: authentication, basics of public key and private key cryptography, digital signatures and certificates, firewalls.

## **F.6. Department level contacts for admission process enquiries**

For queries related to MS admissions, you can send an email to [pgadmissions.cse@iitdh.ac.in](mailto:pgadmissions.cse@iitdh.ac.in) with the Subject “Query related to MS Admissions for CSE”. Please visit the website- [https://www.iitdh.ac.in/academics\\_ms.php](https://www.iitdh.ac.in/academics_ms.php) regularly to get the latest information on MS admissions for the CSE Department



## **G. DEPARTMENT OF ELECTRICAL, ELECTRONICS AND COMMUNICATION ENGINEERING (EECE)**

### **G.1. Eligibility for Admission**

#### **G.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 TA & PA 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:**

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.**

#### **Minimum score in GATE**

For General/General (EWS) category candidates and/or for candidates where no concession in academic performance is called for, **the eligibility requirement in the GATE score is a soft-cutoff of 350. And for other categories, relaxation is given as per GOI norms.**

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

#### **G.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 Spring 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.



## G.2. Financial support category

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

## G.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.**

**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 Flexible Electronics, Gas sensors, Nano-electronics, GaN-based HEMTs, Silicon Carbide Power Diodes and Semiconductor Radiation Detectors.

### A. Power & Energy Systems:

Power Systems: Power system stability and control; Renewable Energy Sources (Solar PV/Wind), Grid-Tied Inverters (Synchronization, Control and Compliance), Grid Forming Technology, Microgrid operation and reliability, Power Quality detection and mitigation, Power factor correction techniques for AC to DC systems, Battery management system (BMS) for Battery energy storage systems (BESS), Sustainable Transportation, Electric Vehicle Grid Integration (resilient charging infrastructure and grid impact study), 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

Electrical Machines and Magnetic Components: Design of rare-earth-free electrical machines for EV applications, Analysis and modelling of core joints in transformers and electrical machines with segmented cores, Development of digital twin technology for condition monitoring of distribution transformers, Design of superconducting magnets for cryogenic applications.

**B. 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.

**C. Signal Processing and Machine Learning:** Image processing and computer vision, 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.

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

### **G.3. Research Areas for PA category**

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

### **G.4. Selection process**

All the eligible candidates will be invited for a round of interview via video conferencing. A final shortlist will be announced based on the interview performance. Syllabus for the interview is given in Section G.4.1 of this document.

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).

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

#### **G.4.1. Syllabus – EECE**

**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.

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

For queries related to MS admissions in EECE 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”.

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

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

#### **H.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 (Teaching Assistantship) and PA (Project Assistantship) 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).

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

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

For General/EWS//OBC (NCL) 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.

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

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

The students who are in the final phase of receiving the above mentioned qualifying degree and are likely to graduate before the commencement of the Spring 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 [H.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.

### H.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 Spring Semester 2023-24:

- a) TA (Teaching Assistantship)
- b) PA (Project Assistantship)
- c) EX: Please note that ONLY 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. College Teachers and regular candidates are NOT eligible to apply under EX category. (Refer section B.4, page 4 for more details)

### H.4. Information on project category

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

- a) Project: **23SP\_MMAE\_MS\_PA01**

Broad area: Metallic Additive Manufacturing (AM), 3D Printing, 4D Printing, Actuators, Programmable

Eligible social category to apply – All categories

Fee – Please see section “Fees, deposits & hostel rent”

Duration of the funding - 2 years subject to availability of funds.

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

Number of openings: 1

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

Brief Description:

4D printing is an extension of 3D printing with additional shape transformation over the time. The present proposal focuses on the development of portable setup(s) designed to build SMP/SMPCs (Shape Memory Polymer Composites) based gradient 4D printed parts by employing Fused Deposition Modelling (FDM)/Digital Light Processing (DLP) additive

manufacturing (AM) technique. Since the built novel 4D printed parts makes use of functional/smart materials, the parts can be programmed/re-programmed to achieve definite desired configurations.

b) Project: **23SP\_MMAE\_MS\_PA02**

**Broad area:** Metallic Additive Manufacturing (AM), Fatigue Crack, Wire Arc Additive Manufacturing

Eligible social category to apply – All categories

Fee – Please see section “Fees, deposits & hostel rent”

Duration of the funding - 2 years subject to availability of funds.

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

Number of openings: 1

Topic: Fatigue Crack Growth study of Wire Arc Additively Manufactured (WAAM) components

**Brief Description:**

Wire Arc Additive Manufacturing (WAAM) is the most sophisticated technique used to manufacture desired parts by material depositing in layer-by-layer sequence. In the proposed project, the Inconel 718 samples will be prepared using the WAAM process. Finding range of process parameters like welding current, torch speed, stepover increment, for smooth weld bead Inconel 718 wire. Finding relation between process parameters with mechanical properties like hardness, tensile, Fatigue etc. will be studied. Fatigue crack growth life of the vertical and horizontal compact tension specimens will be evaluated experimentally with and without heat treatment.

c) Project: **23SP\_MMAE\_MS\_PA03**

**Broad area:** 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 to 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.

## H.5. Shortlisting of Applications

Modality of selection process

- For the TA/PA 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.

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.

## H.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 setup 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

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

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

1. **Thermal and Fluids Stream:** Atomization and sprays, Computational fluid dynamics, Fire dynamics, Multiphase flows, Turbomachinery aerodynamics, Combustion and Thermoacoustics, Dynamics of thin films
2. **Design Stream:** Fracture mechanics, Finite Element Analysis, Biomechanics, Multibody kinematics and dynamics, Tribology, Computer vision and augmented reality, Reduced order modeling
3. **Manufacturing Stream:** Metal forming, Additive manufacturing, Computational Materials Design, Physical and Mechanical Metallurgy, Digital Twins, Structural Materials for Aerospace and Automobile. Constitutive modeling of liquid state processing of metals and composites and severe plastic deformation, Foam casting, Computational materials science, Self-clean/Superhydrophobic Coatings & Multifunctional coatings and adhesives, light-weight composites.



## H.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 paragraphs.
- **Non-verbal reasoning:** inductive, logical, abstract, diagrammatic and spatial reasoning.

### Design Stream

- **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 Stream**

- **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 Stream**

- **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.

#### **H.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”.

## 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:

---

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)

=====\*\*\*\*\*=====

**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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