Indian Institute of Technology Dharwad

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Information Brochure

(For Indian Nationals)

M.S. Admissions

Spring Semester 2022-23

CONTENTS

Section I

General Information on

Admission Process

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

Sr. No.	Description	Relevant dates*
1.	Applications open	14-October-2022
2.	Last Date to apply online	10-November-2022
3.	Announcement of shortlist of eligible candidates	15-November-2022
4.	Online Interview Schedule	16-November-2022 to 30th November 2022
5.	Declaration of provisional list of selected & waitlisted candidates	09-December 2022
6.	Admission process for recommended candidates	10-December 2022 to 15-December 2022
7.	Admission for waitlisted candidates	17-December 2022 to 27-December 2022

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

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 for any errors/issues pertaining to payment of application fees.

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.

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 fee applicable for admission to MS programmes (as collected during the Autumn 2022-23 semester) is provided below for reference purpose only. **The actual fee to be paid for Spring 2022-23 semester 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
A. One-time payment at the time of Admission			
1.	Admission Fee	2,200.00	2,200.00
2.	Graduation Transcript Fee	500.00	500.00
3.	Medical Examination	400.00	400.00
4.	Provisional Certificate	500.00	500.00
5.	Thesis Fee	2,500.00	2,500.00
6.	Student Welfare Fund	1,000.00	1,000.00
7.	Modernisation & Upgradation	2,500.00	2,500.00
8.	Identity Card	500.00	500.00
Sub-Total (A)		**10,100.00**	**10,100.00**
B. Semester Fee			
^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	1,750.00	1,750.00
5.	Student Benevolent Fund	500.00	500.00
6.	Medical Fee	1,500.00	1,500.00
*7.	Hostel 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
Sub-Total (B)		**20,050.00**	**15,050.00**
Mess Advance		**26,000.00**	**26,000.00**
C. Deposits (Refundable) to be paid at the time of Admission			
1.	Institute Security Deposit	1,000.00	1,000.00
2.	Library Security Deposit	1,000.00	1,000.00
3.	Mess Security Deposit	1,000.00	1,000.00
Sub-Total (C)		**3,000.00**	**3,000.00**
GRAND TOTAL FEE (A + B + C+ Mess Advance)		**59,150.00**	**54,150.00**

Note:

a. All the SC/ST/Divyangjan students are exempted from payment of Tuition fee.
b. ***Students not staying in the campus or not provided married accommodation are not required to pay fee at sl. no. 7, 8, 9, 10 & 11.**
c. ^IIT Dharwad reserves the right to revise the Tuition Fee-Statutory Fee (in future).

D.2 Project/External/FA/Other categories

The fee applicable for admission to MS programmes (as collected during the Autumn Semester 2022-23) is provided below for reference purpose only. **The actual fee to be paid for Spring 2022-23 semester 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
A. One-time payment at the time of Admission			
1.	Admission Fee	2,200.00	2,200.00
2.	Graduation Transcript Fee	500.00	500.00
3.	Medical Examination	400.00	400.00
4.	Provisional Certificate	500.00	500.00
5.	Thesis Fee	2,500.00	2,500.00
6.	Student Welfare Fund	1,000.00	1,000.00
7.	Modernisation & Upgradation	2,500.00	2,500.00
8.	Identity Card	500.00	500.00
	Sub-Total (A)	**10,100.00**	**10,100.00**
B. Semester Fee			
^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	1,750.00	1,750.00
5.	Student Benevolent Fund	500.00	500.00
6.	Medical Fee	1,500.00	1,500.00
*7.	Hostel 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
	Sub-Total (B)	**40,050.00**	**15,050.00**
	Mess Advance	**26,000.00**	**26,000.00**
C. Deposits (Refundable) to be paid at the time of Admission			
1.	Institute Security Deposit	1,000.00	1,000.00
2.	Library Security Deposit	1,000.00	1,000.00
3.	Mess Security Deposit	1,000.00	1,000.00
	Sub-Total (C)	**3,000.00**	**3,000.00**
	GRAND TOTAL FEE (A + B + C+ Mess Advance)	**79,150.00**	**54,150.00**

Note:

a. All the SC/ST/Divyangjan students are exempted from payment of Tuition fee.
b. ***Students not staying in the campus or not provided married accommodation are not required to pay fee at sl. no. 7, 8, 9, 10 & 11.**
c. ^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 https://www.iitdh.ac.in/ 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 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% aggregate marks in both BSc in Computer Science and MSc in Computer Science.

4. Candidates with MCA have eligibility criteria of a minimum of 60% aggregate marks in both BCA and MCA.

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 minimum 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 Autumn 2022-23 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 Autumn 2022-23 semester –

a) TA: *In this call, applications are invited under TA category only for research areas (1)-(4) 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

c) Project Assistantship:

Code: SP22_MS_CSE_STSR1

Title: Speech Technologies in Indian Languages - Speaker Recognition

Description: This project involves development of artificial intelligence and deep learning-based systems for speaker recognition.
Broad domain of research: Speech Processing, Natural Language Processing, machine learning and deep learning.
Requirement: The candidate should have exposure to the basics of probability, signal processing and good programming skills in python.
Type of funding support – PA (Rs. 25000/- ; additional HRA applicable if staying outside campus; it may vary as per the policy applicable from time to time)
Duration of funding - 3 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 and 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 interview 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) 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, ML for Cyber Physical Systems, Mining large data streams, ML for Cyber Security, 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):** Application of neural networks on Edge devices, Reliability and robustness of Advanced driver assistance systems (ADAS), Modeling and characterization of heterogeneous processors, Runtime Verification of Hardware and Efficient Computer Architectures.
4. **Theoretical Computer Science (TCS):** Algorithms, Concurrency, Formal Verification, and Graph Theory.
5. **High Performance Computing and Programming Languages (HPCPL):** Parallel Computing, Compilers and Translation Systems, Programming models and runtime systems.

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

F.5 Syllabus – Computer Science and Engineering

- **Engineering Mathematics**
  Discrete Mathematics: 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,

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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**
  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.

- **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 with the Subject "Query related to MS Admissions for CSE".

Please visit the website- 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 ENGINEERING

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 (EC/EE/IN)*
3. A minimum GATE score of 320 (EC/EE/IN) for General category and for other categories, relaxation is given as per GOI norms.

*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:

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.

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 Autumn 2022 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 Electrical Engineering admits candidates for full time M.S. Programme, under Teaching Assistantship (TA) and Project Assistantship (PA) category only.

G.3. Research Areas
G.3.1. 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.

   Eligible social category to apply: - Gen, Gen (EWS), OBC, SC, ST and PwD

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

   Eligible social category to apply: - Gen, Gen (EWS), OBC, SC, ST and PwD

C. **Power & Energy Systems:**

   (1) <u>Power Systems</u>: 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.

   (2) <u>Power Electronics</u>: Converters and Controls: DC/DC and DC/AC converters for applications in Electric Vehicle; 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.

   Eligible social category to apply: - Gen, Gen (EWS), OBC, SC, ST and PwD

D. **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.

   Eligible social category to apply: - Gen, Gen (EWS), OBC, SC, ST and PwD

G.3.2. Project positions (PA category): No reservation is applicable for PA category
G.3.2.1 Position-1

Code –Sp22_MS_EE_FDL

Project Title: Federated Deep Learning for Caching in 5G and Beyond Networks

Description: This project involves designing efficient ML based caching algorithms for the next generation wireless networks.

Broad domain of research: Wireless communications/networks, caching, Deep learning for communication, 5G and beyond.

Requirement: The candidate should be interested in working on theoretical problems. He/She should have a good understanding of basic communication systems and probability theory. Good knowledge in programming is an added advantage.

Type of funding support – PA (Rs. 31000/- ; additional HRA applicable if staying outside campus; it may vary as per the policy applicable from time to time)

Duration of funding - 2 years

Number of openings: 1.

G.3.2.2 Position-2
Code – Sp22_PhD_MS_EE_PowerSystem

Project Title: UNIFY (solutions for clean energy iNtegration in power grids with Improved FlexibilitY)

Description: This project involves the development of situational awareness algorithms to maximize renewable energy integration.

Broad domain of research: Power System/Smart Grid.

Requirement: The candidate should have exposure to the basics of power systems, electrical machines, and network theory.

Type of funding support – PA (Rs. 35000/- ; additional HRA applicable if staying outside the campus; it may vary as per the policy applicable from time to time)

Duration of funding - 3 years

Number of openings: 1.

G.3.2.2 Position-3
Code – Sp22_MS_EE_Comm

Project Title: Developing Efficient Communication Infrastructure for Connecting Sensors to Cloud

Description: This project involves designing and deployment of communication infrastructure for collecting sensor data and transmitting it to a cloud server. In addition, questions such as where to place sensors and when information must be sampled, for meaningful reconstruction of the physical variables being monitored, may need to be answered.

Broad domain of research: Wireless communication, embedded systems, signal processing.

Requirement: The candidate must have background in communications and signal processing with experience in embedded programming.

Type of funding support – PA (Rs. 35000/- ; additional HRA applicable if staying outside the campus; it may vary as per the policy applicable from time to time)

Duration of funding – 1.5 years

Number of openings: 2.

G.3.2.2 Position-4

Code – 22Sp_MMAE_MS_PA02 / 22Sp_EE_MS_PA

Project Title: Grading of farm produce quality using computer vision and machine learning.

Description: The project will focus on applied research to translate computer vision and machine learning techniques for classification of the farm produce. Major focus will be on the assessment of various techniques to capture the scene appropriately and algorithms to efficiently and effectively provide automated inferences using low-cost hardware. The project is funded by IIT Dharwad SPOKE for the BITS BioCyTiH Foundation.

Broad domain of research: Computer Vision, AI in Agriculture, 3D modeling.

Requirement: The candidate must have background in Computer Vision, AI in Agriculture, 3D modeling.

Type of funding support – The proposed stipend Rs. 42,760/- per month; No additional HRA applicable; it may vary as per the policy applicable from time to time.

Duration of funding – 3 years subject to availability of funds.

Number of openings: 2.

G.4. Modality of selection process

Shortlisted candidates are invited for the first round of interviews via video conferencing. After the first-round interviews, a shortlist will be announced for the second round of interviews. The shortlisted candidates will be asked to attend the second round of interview via video conferencing. 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.

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

G.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.

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)*
3. A minimum GATE score of **460 for General** category and for other categories, relaxation is given as per GOI norms.

*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).

H.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.

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 above mentioned qualifying degree and are likely to graduate before the commencement of the Spring 2022-23 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 2022-23:

a) TA (Teaching Assistantship)

b) PA (Project Assistantship)

c) EX (External Category)

H.4 Information on project category

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

a) Project: **22Sp_MMAE_MS_PA01**

Broad area: Materials Science and Solid Mechanics

Eligible social category to apply – All categories

Fee – Please see section "Fees, deposits & hostel rent"

Duration of the funding - 2 year 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: Investigation of mechanical twinning and their interaction with dislocation slip in Mg alloy using experimentally informed discrete twinning crystal plasticity model

Brief Description: Recently, Magnesium (Mg) alloys as lightest commercially available structural metallic materials, has attracted a substantial research interests. Owing to their high specific strength, stiffness, damping properties, and recyclability, Mg alloys have great potential for industrial application. However, poor room temperature formability, high anisotropy and complexity introduced by profuse twinning, hamper their widespread applications as compared to Aluminum alloys and steels. This is caused by insufficient number of easily activated slip systems in their hexagonal close packed (HCP) low-symmetry crystals which makes twinning a prominent mechanism to accommodate the imposed plastic deformation. Under the scope of this project, MS candidate is expected to help in further development of an experimentally informed discrete twinning crystal plasticity model for the accurate representation of mechanical twinning and its interaction with dislocation slip to predict the micromechanical behavior of Mg alloys. In this regard, MS candidate will collect the macro and microscopic experimental data from literature as well as by conducting relevant experiments and materials characterization. In addition, MS student will also help in the implementation of the model in the crystal plasticity module in the larger framework of open source PDE solvers.

b) Project: **22Sp_MMAE_MS_PA02/22Sp_EE_MS_PA****

Broad area: Computer Vision, AI in Agriculture, 3D modeling

Eligible social category to apply – All categories

Fee – Please see section "Fees, deposits & hostel rent"

Duration of the funding - 3 years subject to availability of funds.

Stipend: The proposed stipend Rs. 42,760/- per month; No additional HRA applicable; it may vary as per the policy applicable from time to time.

Number of openings: 2

Topic: Grading of farm produce quality using computer vision and machine learning

Brief Description:

The project will focus on applied research to translate computer vision and machine learning techniques for classification of the farm produce. Major focus will be on the assessment of various techniques to capture the scene appropriately and algorithms to efficiently and effectively provide automated inferences using low-cost hardware. This project is funded by IIT Dharwad SPOKE for the BITS BioCyTiH Foundation.

c) Project: **22Sp_MMAE_MS_PA03**

Broad area: Multiphase Flow, Computational and Experimental Fluid Dynamics, High-Speed Imaging, Ink-Jet Printing, Microfluidics

Eligible social category to apply – All categories

Fee – Please see section "Fees, deposits & hostel rent"

Duration of the funding - 2 year 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: Drop impact on a solid surface: Dynamics of Splashing, Spreading and Bouncing.

Brief Description:

Drop impact process is important in several industrial applications such as spray coating and painting, cleaning, cooling, and combustion. In the case of spray painting, bouncing and splashing are undesirable as it leads to wastage of materials. It is very important to understand the splashing-spreading-bouncing transition boundaries to optimize the drop size distribution and impact velocity. Inkjet printing technology is based on the impact of micro-drops on solid surfaces and understanding drop-surface interaction is of utmost importance for the optimization of the printing process. With the increasing role of inkjet-based 3D printing in the fabrication of microstructures, the subject has become an intrinsic part of additive manufacturing technology. Motivated by the drop dynamics in lotus leaves, scientists have tried to fabricate patterned surfaces which have the inherent ability to keep a surface free from contamination and pollution. Complete understanding of the drop-surface interaction is of utmost importance for optimizing the fabrication process of self-cleaning surfaces. Self-cleaning surfaces has gotten huge attention in recent years because

of its importance in many applications, from cleaning the outer surfaces of skyscrapers, cleaning of the glasses of vehicles (for better visibility during rain), to the cleaning of micro-capillary tubes. Motivated by these diverse natural phenomena and several industrial applications, we plan to study this subject using a series of high-speed imaging experiments and direct numerical simulations with an aim to address some of the inconclusive investigations in the subject.

d) Project: **22Sp_MMAE_MS_PA04**

Broad area: Manufacturing and Material Science

Eligible social category to apply – All categories

Fee – Please see section "Fees, deposits & hostel rent"

Duration of the funding - 2 year, subject to availability of funds.

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

Desired qualification: Experience in CAD modelling, CNC programming, fabricating experimental setups

Number of openings: 1

Topic: Microstructure Evolution and Mechanical Behaviour during Electric Assisted Forming in HCP materials

Brief Description:

Hexagonal Close Packed (HCP) materials like Magnesium alloys and Titanium alloys possess limited formability at room temperature because of the presence of less number of active slip systems. Conventionally these materials are deformed at high temperatures, which is called super plastic forming in which additional slip systems will be active. Forming at a high temperature demand for dies and tools made of special heat resistant materials, auxiliary equipment, additional space and additional cleaning processes to remove oxide layers. This is restricting the usage of these high strength materials. One can alternatively make use of electro-plasticity principles in place of superplastic forming. It is envisioned that applying high current short duration electric pulses during the deformation can stimulate the dislocation motion increasing the formability of the material. In the present work, microstructural investigation of magnesium and titanium alloys formed using electric assistance is planned to understand the deformation mechanism and microstructure evolution.

e) Project: **22Sp_MMAE_MS_PA05**

Broad area: solar-thermal, prototyping of silos

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. 35,960/- per month; No additional HRA applicable; it may vary as per the policy applicable from time to time.

Number of openings: 1

Topic: Solar-thermal CPS based Metallic silos dryer

Brief Description:

The project will focus on applied research to translate the Solar-thermal assistance for grain storages in silos. Major focus will be on the designing the flow paths for optimal use of solar energy for non-intrusive heating for removal of the moisture from the grains storage, metallic silos. Integration of various sensors, measurements and analysis of operational data would help to further refine the design. The project is funded by IIT Dharwad SPOKE for the BITS BioCyTiH Foundation.

f) Project: **22Sp_MMAE_MS_PA06**

Broad area: Sprays and Atomization

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: Agricultural Sprays

Brief Description:

Design and development of agricultural UAV sprayers.

H.5 Shortlisting of Applications

Modality of selection process

- For the TA category, the selection is based on the **GATE score alone**.

- 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 need to go through one online interview round. The details of the interview round will be communicated to the shortlisted candidates. For such candidates, there will be 70% weightage from GATE and 30% weightage from the interview for the final selection as MS scholars under the PA 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.

H.6 **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 and cc to pgadmissions@iitdh.ac.in with the subject "Query related to MS Admissions in MMAE".

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

(To be typed on letterhead of the Sponsoring Organization)

Name of the applicant:

_____

Name of the sponsoring organization:

_____

Address:

_____

Present Designation of the applicant:

_____

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

_____

Division where research work is proposed to be done:

_____

Name of supervisor from the sponsoring organization:

_____

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

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

_____

_____

_____

_____

Statement of proposed Co-supervisor (external)

If Shri / Kum. / Smt._____

is registered for the doctorate degree, I ,_____

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

Date: Signature of proposed Co-supervisor (external)

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Statement of sponsoring authority

If Shri. /Kum. / Smt. _____

is admitted to the 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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