Research Topics Available for PhD Admission Spring 2023-24 in the Department of Metallurgical Engineering & Materials Science, IIT Bombay

Domain definition (for interview purpose):

- **Domain A :** Physical & Mechanical Metallurgy; Process Metallurgy & Manufacturing; Structural Ceramics
- **Domain B :** Electronic, Magnetic and 2D Materials; Energy Materials
- **Domain C :** Polymers & Soft Matter; Corrosion & Coatings

Topics for TA Category

	Title	Suitable subject background of applicant (in eligible qualifying degree)	Faculty Name/Email
	Generative Machine Learning Models and Molecular Dynamics Simulations for Antimicrobial Peptide Design (Relevant to Domain C)	B.Tech/M.Tech(Metallurgical Engg, Materials Sc & Engg., Chem. Engg, Mech. Engg, Polymer Engg.) or MSc (Physics)	Ajay Singh Panwar panwar@iitb.ac.in
	Theory and experiment of thermoelectric phenomena in Heusler alloys (Relevant to Domain B) or Theory and experiment of interplay of magnetic, optical and transport properties in double Perovskite compounds. (Relevant to Domain B)	Physics, Materials Science, Applied physics, Electronics Engineering, Mechanical Engineering or Physics, Applied Physics, Materials Science, Physical chemistry, Electronics Engg., Mechanical Engg.	Amrita Bhattacharya b_amrita@iitb.ac.in

	Thermomechanical response of 'high entropy' oxides (Relevant to Domain A) or Smart thermal and environmental barrier coatings for spectroscopic sensing (Relevant to Domain A)	Any background eligible for M.E.M.S. Department	Ashutosh S. Gandhi and Nagamani Jaya Balila (for topic 1) agandhi@iitb.ac.in
	Perovskite polymer composites for Optoelectronic devices (Relevant to Domain B)	Any Masters degree	Aswani Yella aswani.yella@iitb.ac.in
	Designing a superconducting diode (Relevant to Domain B)	MSC in Physics, MTech in Materials Science, Electrical engineering	Avradeep Pal avradeep@iitb.ac.in
	Development of thin film batteries (Relevant to Domain B) or Printed electronic devices and sensors (Relevant to Domain B)	Masters in Materials, Metallurgy, chemical, electrical, mechanical, energy . MSc in Physics, Chemistry or Masters in Electrical, Materials, Metallurgy, Mechanical, Chemical. MSc in Physics, Chemistry	Dipti Gupta diptig@iitb.ac.in

	Martensite Microstructure and Fatigue Life (Relevant to Domain A) or Structure Property Correlation in PH grade Stainless Steel (Relevant to Domain A)	Mechanical/Metallurgy	Indradev Samajdar indra@iitb.ac.in
	Relating relaxation of solid polymers to ionic conductivity of battery electrolytes or Charge transport and molecular mobility in bilayer polymer films (Relevant to Domain C)	MSc: Physics, (Physical) Chemistry M Tech/B Tech: Chemical Engg, Electrical Engg, Materials Science	Mithun Chowdhury mithunc@iitb.ac.in
	Deformation studies in high temperature alloys (Relevant to Domain A)	Metallurgical Engineering and Materials Science, Mechanical Engineering	Prita Pant and MJNV Prasad pritapant@iitb.ac.in
	Polymer Nano composites for Piezo/photo Catalysis (Relevant to Domain C)	Mtech	Prasanna Kumar S Mural prasannamural@iitb.ac.in
	Developing HIT IBC solar cells (Relevant to Domain B)	M.Sc. Physics, M.Tech. Materials Science	Rajiv O. Dusane rodusane@iitb.ac.in and Triratna Muneshwar tmuneshwar@iitb.ac.in

	Standardization of electrochemical impedance spectroscopy for industrial corrosion evaluation (Relevant to Domain C) or Experiment and modelling on cut-edge corrosion in metallic coatings (Relevant to Domain C)	M.Tech. in metallurgy, materials science, mechanical engineering, electrochemical science/engineering; 2) M.Sc. chemistry, polymer chemistry, applied chemistry or M.Tech. in metallurgy, corrosion science, materials science, nanotechnology, mechanical engg., chemical engineering,; M.Sc in physical chemistry	S. Parida and Sanjay Chandra (for topic-2) paridasm@iitb.ac.in
	Towards "green" ironmaking: Comparative study between the role of CO and hydrogen for iron oxide reduction (Relevant to Domain A)	B.Tech. or equivalent in Metallurgical/Materials Engg.; (ii) M.Tech. with specialisation in process metallurgy/extactive metallurgy/metal casting	Somnath Basu somnathbasu@iitb.ac.in
	Development of 2D materials for Energy Storage (Relevant to Domain B) or Investigating 2D Silicon Chemistry Using Density Functional Theory (Relevant to Domain B)	Any or any engineering/science PG	Sumit Saxena Sumit.saxena@iitb.ac.in

	3D patterned nano-microstructures for monitored drug delivery (Relevant to Domain B)	Masters in Material Sc & Engineering, Physics, Chemistry, Photonics, Electrical or any other relevant branch of Science & Engineering	Shobha Shukla sshukla@iitb.ac.in
	Defect engineering in layered semiconductors (Relevant to Domain B)	MSc Physics, Materials Science; BTech/MTech Metallurgy and Materials Science	Tanushree Choudhury tanuhc@iitb.ac.in
	Synthesis and Study of Thermoelectric properties of Zintl compounds (Relevant to Domain B) or Study and development of segmented thermoelectric devices for power generation (Relevant to Domain B)	Materials Science, Ceramics, Metallurgy, Chemistry, Physics or Materials Science, Ceramics, Metallurgy, Mechanical, Electrical, Physics, Chemistry	Titas Dasgupta titas.dasgupta@iitb.ac.in
	Effect of electron-phonon interaction on the structural and electronic properties of 3D and 2D layered materials (Relevant to Domain B)	MSc Physics/Materials Sci, B.Tech/M.Tech in Met/Elec/Ceramic/Mech Engg	T.R.S. Prasanna and Amrita Bhattacharya prasanna@iitb.ac.in
	Metal semiconductor contact studies for thin film device applications (Relevant to Domain B)	Physics, Electrical, Materials, Microelectronics	Triratna Muneshwar tmuneshwar@iitb.ac.in

Topics for TAP Category

Code	Title	Suitable subject background of applicant (in eligible qualifying degree)	Faculty Name/Email
TAP-1	Alloying-reaction based anode materials for Li-ion and Na-ion batteries (Relevant to Domain A and B)	All eligible backgrounds	Amartya Mukhopadhyay amartya_mukhopadhyay@iitb.ac.in
TAP-2	Development of nano-structured high strength steels for advanced structural applications (Relevant to Domain A)	BTech/MTech Materials Science, Metallurgy, Mechanical Engineering	Aparna Singh aparna_s@iitb.ac.in
TAP-3	Fatigue Resistance through Grain Boundary Engineering: Focus Lifing of Inconel 718 Forging (Relevant to Domain A)	Mechanical/Metallurgy	Indradev Samajdar and Sushil Mishra indra@iitb.ac.in
TAP-4	Fatigue Life in Martensite (with John Deere) (Relevant to Domain A)	Mechanical/Metallurgy	Indradev Samajdar and Sushil Mishra indra@iitb.ac.in
TAP-5	Surfactant mediated growth of layered semiconductors (Relevant to Domain B)	MSc Materials Science, MSc Physics, BTech/Mtech Metallurgy and Materials Science	Tanushree Choudhury tanuhc@iitb.ac.in
TAP-6	Study and Development of High Efficiency Segmented Thermoelectric Generators by combining Experiments with Multiscale Modelling (Relevant to Domain B)	Materials Science, Metallurgy, Electrical Engineering, Mechanical Engineering, Ceramics, Physics	Titas Dasgupta titas.dasgupta@iitb.ac.in

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TAP-7	Development of Corrosion-Fatigue Resistant Coated Aluminium Aircraft Skins (Relevant to Domain C)	Metallurgical Engineering, Materials Science, Mechanical Engineering	Prita Pant and Nagamani Jaya Balila pritapant@iitb.ac.in
TAP-8	Simulating the influence of basic oxide additions on the kinetics of iron oxide reduction (Relevant to Domain A)	B.Tech. or equivalent in Metallurgical/Materials Engg.; (ii) M.Tech. with specialisation in process metallurgy/extactive metallurgy/metal casting	Somnath Basu somnathbasu@iitb.ac.in

NOTE:

Please note that the topics (*i.e.*, other than the TAP topics), as in the department website (https://www.iitb.ac.in/mems/en/phd-admission), which do not have any code, are **TA topics** available for this round of admission. You do not have to give any preference for those.

We do not advertise separate topics for candidates who applied under FA/SW/EX/CT/PS categories, while they will be interviewed under their chosen research domain. Upon successful interview, in case the candidate is offered admission in any of those categories, they can decide research topic and guide (faculty) after mutual discussion and interests. In case if you have already had discussion with any of the faculty members in MEMS department, you are welcome to indicate the name of faculty while filling the 'preference google form'.

Shortlisted candidates, post written test, will get email containing link of the 'preference google form'. The google form will be sent to the email id used in the original application form.

While filling the google form,

(a) Interested TA/RA/SF candidates can choose a maximum of two TAP topic choices(s) and those may preferably be relevant to the chosen research domain. Make sure that your technical background, expertise and degree(s) meet the eligibility criteria set by PI of the TAP and have relevance to the topic.

(b) Because of differences in admission process for each category, it is not possible to entertain any request for changing the category (for example, TA to TAP, TAP to TA, FA/SW/EX/CT to TA/TAP) at any stage after getting admitted. Suggested to read the guidelines mentioned in the Institute information brochure (https://www.iitb.ac.in/newacadhome/Ph.D.Brochure2023-24.pdf). Since there are no RA seats in this round of admissions, the candidates who applied for RA category will be considered under TA category.