# List of TA / TAP topics in the following domains available for Autumn 2025 PhD admission

## Research Domains

**A:** Physical & Mechanical Metallurgy;

**B :** Process Metallurgy & Manufacturing**;**

**C:** Structural Ceramics

**D:** Electronic, Magnetic and 2D Materials;

**E:** Energy Materials

**F:** Polymers & Soft Matter;

**G:** Corrosion & Coatings

**H:** Modelling & Simulation

## TA topics

| Faculty | Desired Qualification | Title |
|---|---|---|
| A. S. Gandhi & N. Jaya Balila<br><br>A. S. Gandhi<br>agandhi@iitb.ac.in | M.Tech./M.E. in Metallurgy, Materials Science, Ceramics, B.Tech./B.E./M.Sc. in Metallurgy, Materials Science, Ceramics, Mechanical engineering<br><br>M.Tech./M.E. in Metallurgy, Materials Science, Ceramics, B.Tech./B.E./M.Sc. in Metallurgy, Materials Science, Physics, Ceramics, Mechanical | Mechanical behaviour of 'high entropy' oxide ceramics<br>(Relevant to Domain A, C)<br><br>Or<br>Spectroscopic condition monitoring of high temperature coatings in gas turbine engines<br>(Relevant to Domain A, C) |
| Abhinandan Gangopadhyay<br><br>Abhinandan Gangopadhyay & Apurba Laha<br>abhinandan.g@iitb.ac.in | B.E./B.Tech./M.E./M.Tech. in Metallurgical Engineering, Materials Engineering, Electrical Engineering, Mechanical Engineering; M.Sc. or equivalent in Physics.<br><br>B.E./B.Tech./M.E./M.Tech. in Metallurgical Engineering, Materials Engineering, Electrical Engineering, Mechanical Engineering; M.Sc. or equivalent in Physics. | Multimodal transmission electron microscopy of defects and interfaces in advanced materials<br>(Relevant to Domain D, E)<br><br>Or<br>Development of next generation III-nitride quantum emitters: growth and characterization<br>(Relevant to Domain D, E) |
| Amartya Mukhopadhyay<br>amartya_mukhopadhyay@iitb.ac.in | Materials Science/Engineering and related areas (including metallurgy), Electrochemistry, Physics, Chemistry, Ceramics | Functional electrode or solid electrolyte materials for Li-ion and Na-ion batteries (electrochemical energy storage; from materials to electrochemistry to cell development)<br>(Relevant to Domain E) |
| Amrita Bhattacharya<br>b.amrita10@gmail.com | Physics, Materials Science, Electronics | Computational exploration of spintronics application of correlated oxides<br>(Relevant to Domain D) |

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| | | Or<br>Computational exploration of Rashba Spintronics in Oxides<br>(Relevant to Domain D) |
| Anirban Patra<br>anirbanpatra@iitb.ac.in | Mechanical/Aerospace/Materials | Modeling irradiation-induced deformation in zirconium alloys for nuclear applications<br>(Relevant to Domain H) |
| Aparna Singh<br>aparna_s@iitb.ac.in | BTech/MTech Materials Science, Metallurgical Engineering, Mechanical Engineering<br><br>BTech/MTech materials Science, metallurgical engineering, Mechanical Engineering | Development of carbon fiber composites with nano-fillers for space applications<br>(Relevant to Domain A, F)<br>Or<br>Development of nano-structured steels for space and defence applications<br>(Relevant to Domain A) |
| Arup R. Bhattacharyya<br><br>arupranjan@iitb.ac.in | M.Tech. in Polymer Science & Engineering, Materials Science & Engineering, Chemical Engineering; M.Sc. in Physics or Chemistry<br><br>M.Tech. in Polymer Science & Engineering, Materials Science & Engineering, Chemical Engineering; M.Sc. in Physics or Chemistry | 2D Nano-materials based poly(vinylidene fluoride) nano composites for piezoelectric applications<br>(Relevant to Domain F)<br>Or<br>Poly (vinyl alcohol) nanocomposite hydrogels for triboelectric nanogenerator applications<br>(Relevant to Domain F) |
| Avradeep Pal<br>avradeep@iitb.ac.in | M.Sc in Physics, MTech in Materials Science, M.Tech. in Electronics or Electrical Engineering | Josephson effect with artificial non-centrosymmetric superconductors<br>(Relevant to Domain D)<br>Or<br>Fabrication of high frequency Josephson memory devices<br>(Relevant to Domain D) |
| Abhijeet L. Sangle<br>alsangle@iitb.ac.in | All science and engineering streams | Flexible wearable thermoelectric devices<br>(Relevant to Domain D, E) |
| Ajay Singh Panwar<br>panwar@iitb.ac.in | B.Tech/M.Tech in Metallurgy/Materials/Chemical/Mechanical or MSc in Physics/ Chemistry (Physical)<br><br>B.Tech/M.Tech in Metallurgy/Materials/Chemical/Mechanical | Machine Learning and Molecular Simulations of Biopolymers<br>(Relevant to Domain F, H)<br><br>Or<br>Multi-scale Simulation of Iron Oxide Reduction in Hydrogen Atmosphere (with Prof Indradev Samajdar)<br>(Relevant to Domain A, H) |
| Deepoo Kumar & Prof M P Gururajan<br>deepook@iitb.ac.in | Metallurgical Engineering, Mechanical Engineering or Chemical Engineering | Role of argon bubbles on inclusion removal during continuous casting<br>(Relevant to Domain B) |

Research Topics Available for PhD Admission Autumn 2025-26 in the Department of Metallurgical Engineering & Materials Science, IIT Bombay

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| Dipti Gupta<br>diptig@iitb.ac.in | BTech or M.Tech. in Materials/Metallurgy/Chemical/Electrical/Mechanical or MSc in Physics/Chemistry<br><br>BTech or M.Tech. in Materials/Metallurgy/Chemical/Electrical/Mechanical or MSc in Physics/Chemistry | Development of flexible semiconductor devices<br>(Relevant to Domain D)<br>Or<br>Development of flexible and printed sensors<br>(Relevant to Domain D) |
| Jayasree Biswas<br>biswasj@iitb.ac.in | B.E/ B.Tech./ M.E./ M.Tech. in Metallurgy, Mechanical, Chemical Engineering | Kinetic studies in green steelmaking<br>(Relevant to Domain B)<br>Or<br>Recycling of Urban Ores<br>(Relevant to Domain B) |
| M P Gururajan<br>guru.mp@iitb.ac.in | Physics, Materials Science, Metallurgy, Mechanical Engineering, and, Chemical Engineering | Development of Machine Learned Interatomic Potentials for Molecular Simulations<br>(Relevant to Domain D, H) |
| Manish M Pande<br>manish.pande@iitb.ac.in | B.Tech / BE/ M.Tech. Metallurgy or Chemical | Application of slag engineering to steel refining processes<br>(Relevant to Domain B)<br>Or<br>Thermodynamics of steel refining reactions<br>(Relevant to Domain B) |
| Mithun Chowdhury<br>mithunc@iitb.ac.in | MSc Chemistry/Physics, BTech/MTech Chemical Engineering, Materials Science, Polymer Science<br><br>MSc Chemistry/Physics, BTech/MTech Chemical Engineering, Materials Science, Polymer Science | Vitrimeric polymer thin film dynamics<br>(Relevant to Domain F)<br>Or<br>Entropy and information evolution in non-equilibrated polymers<br>(Relevant to Domain F) |
| Smrutiranjan Parida<br>paridasm@iitb.ac.in | MTech in metallurgy/materials science/ chemical engineering/nanotechnology, MSc or MS chemistry/physics/electrochemistry<br><br>MTech in metallurgy/materials science/ Chemical Engineering/Nanotechnology/ Polymer, MSc or MS Chemistry/ Polymer/ Physics | Corrosion problem in hydrogen production by electrolysis<br>(Relevant to Domain G)<br><br>Or<br>Cool roof coatings<br>(Relevant to Domain G) |
| Shobha Shukla<br>sshukla@iitb.ac.in | Materials, Polymers, Chemistry or any<br><br>Materials, Polymers, Chemistry or any | Metasurfaces to enhance light matter interactions for efficient photodevices<br>(Relevant to Domain D, F)<br><br>Nanocomposite membranes development for water purification<br>(Relevant to D, F) |

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| Sumit Saxena<br>sumit.saxena@iitb.ac.in | MSc in Physics or Chemistry and BTech/MTech or equivalent degree in Energy Science, Nanotechnology, Chemical Engineering, Materials Science | Development of Graphene based materials as electrodes for supercapacitors<br>(Relevant to Domain C, E)<br>Or<br>Development of MXenes based materials for energy storage solutions<br>(Relevant to Domain E) |
| Somnath Basu<br><br>somnathbasu@iitb.ac.in | B.Tech./B.E./equivalent in Metallurgical Engg. / Materials Science / Ceramics<br><br>M.Tech./M.E./equivalent in Metallurgical Engg. / Materials Science / Ceramics<br><br>M.Sc. in Chemistry (focus on inorganic/physical chemistry) | Structural characteristics of environment-friendly oxide-fluoride fluxes for welding applications<br>(Relevant to Domain B)<br>Or<br>Valorisation of recycled solid wastes from metal production for water purification applications<br>(Relevant to Domain B) |
| TRS Prasanna and Amrita Bhattacharya<br>prasanna@iitb.ac.in | M.Sc. Physics / Materials Science<br>M.Tech / B.Tech any | Role of electron-phonon interactions on structural and electronic properties of semiconductors<br>(Relevant to Domain D) |
| Titas Dasgupta<br>titas.dasgupta@iitb.ac.in | Materials Science, Ceramics, Metallurgy, Chemistry, Physics | Synthesis and Study of Thermoelectric properties of Topological Insulators<br>(Relevant to Domain D, E)<br>Or<br>Study and development of segmented thermoelectric devices for power generation<br>(Relevant to Domain D, E) |
| Triratna P Muneshwar<br>tmuneshwar@iitb.ac.in | M. Sc. / M.Tech. in Physics, Electrical or Electronics, Materials science | Electromigration and strategies to mitigate this in miniaturized integrated circuits<br>OR<br>Charge transport in the recombination layer in Silicon-Perovskite tandem solar cells |
| Vijayshankar Dandapani & Prof. MP Gururajan, Prof. NJ Balila<br>v.dandapani@iitb.ac.in | Materials Science, Metallurgy, Mechanical, Physics, Chemistry | Quantifying impact of hydrogen permeation through pipeline steel weldments with computational phase field modelling for safe and reliable blended hydrogen gas transport<br>(Relevant to Domain G) |

## TAP topics

| Faculty | Title | Desired Qualification | |
|---|---|---|---|
| **TAP-1** | Effect of microstructure on the mechanical properties of yttria stabilized zirconia thermal barrier coatings (Pratt and Whitney PhD Fellowship)<br>(Relevant to Domain A, C) | M.Tech./M.E. in Metallurgy, materials science, ceramics.<br>B.Tech./B.E./M.Sc. in Metallurgy, Materials Science, Ceramics, Mechanical Engineering | A. S. Gandhi & N. Jaya Balila<br>agandhi@iitb.ac.in |
| **TAP-2** | Ultrahigh temperature materials for thermal barrier applications | M.Tech./M.E. in Metallurgy, materials science, ceramics. | A. S. Gandhi<br>agandhi@iitb.ac.in |

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| | (Relevant to Domain A, C) | B.Tech./B.E./M.Sc. in Metallurgy, Materials Science, Ceramics, Mechanical Engineering | |
| **TAP-3** | Self-assembled vertically aligned nanocomposites for memory and neuromorphic computing applications (Relevant to Domain D) | All Engineering/Science streams | Abhijeet L. Sangle & Professor Debanjan Bhowmik alsangle@iitb.ac.in |
| **TAP-4** | Design and Development of Safe Sustainable and Cost-Effective Na-ion batteries based on 'Aqueous Processed' Electrodes (Relevant to Domain E) | Materials Science/Engineering and related areas (including metallurgy), Electrochemistry, Chemistry, Physics, Ceramics | Amartya Mukhopadhyay amartya_mukhopadhyay @iitb.ac.in |
| **TAP-5** | Developing of advanced high strength steels for automotive applications (Relevant to Domain A) | BTech/MTech Materials Science, Metallurgical Engineering, Mechanical Engineering | Aparna Singh aparna_s@iitb.ac.in |
| **TAP-6** | Impact of oxygen incorporation on optoelectronic properties on transition metal dichalcogenides (Relevant to Domain D) | MSc Physics, BTech/MTech Materials Science, BTech/MTech Metallurgy. Other specialization may also be considered | Tanushree Choudhury tanuhc@iitb.ac.in |
| **TAP-7** | AlScN-based piezoelectric films for MEMS applications (Relevant to Domain D) | Any Science/Engineering Background | Abhijeet L. Sangle & Ashwin A. Seshia alsangle@iitb.ac.in |
| **TAP-8** | Wafer-scale Emitter and Detector Arrays for Multi-wavelength Room Temperature Photonic Quantum Technologies (Relevant to Domain D) | From Physics, Computation, Materials Science | Amrita Bhattacharya b_amrita@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 TA topics in the preference(s) sheet (a Google link, to be circulated) for the research topic/domain, but for TAP projects available.

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 a discussion with any of the faculty members in MEMS department, you are welcome to indicate the name of the faculty while filling out the 'preference Google form'.

**Shortlisted candidates will get an email containing the link to the 'preference Google form' to give a choice of domain for the interview, and TAP topics available for this admission round. The Google form will be sent to the email ID used in the original application form.**

While filling out 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 the 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://acad.iitb.ac.in/files/Ph.D._Brochure_2025_26.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.