IIT Madras - Faculty Recruitment - Specialization Area - (2024-R)

Specialization Areas

Advt.No.IITM/R/5/2024 Dt 11.03.2024

Department-wise specific qualification requirement (if any), and areas of specialization sought are detailed in the table below. Candidates must clearly demonstrate their capability in the specialization area(s).

SNo	Department	Specific Qualification Requirement	Specialization Area
1	**Aerospace Engineering**	Candidates must clearly demonstrate their capability in the specialization area applied for through publications in relevant reputed journals and have aero background as detailed below: At least one degree (Bachelor's / Master's / Ph.D.) in Aerospace (Aero.) Engineering. (OR) At least 3 years teaching experience in handling undergraduate / graduate level courses related to Aerodynamics / Flight Mechanics / Aerospace Propulsion / Aerospace Structures in an Aero. Engineering department at an IIT / IIST Trivandrum / reputed university abroad. (OR) Ph.D. thesis relevant to Aero. Engineering and awarded by a university without an Aero. Engineering department.	(i) Airplane Design (ii) Airplane Aerodynamics (iii) Experimental structural mechanics (iv) Structural Dynamics (experimental background preferred) (v) Advanced Manufacturing of Aerospace Structures. (vi) Avionics & sensors for aerospace applications (with hardware background) (vii) Air Traffic Management.
2	**Biotechnology**	a) Ph.D. in Biological Sciences with expertise in experimental genomics and/or molecular immunology to investigate molecular pathology and signaling mechanisms.	(i) **Experimental cancer genomics/cancer immunology** *To establish a research group with a strong focus on understanding cancer progression. Expertise in functional genomics / molecular immunology.*
		b) BE / BTech in Computer Science / Electrical Engineering / Chemical Engineering (or) c) Bachelor's degree in Maths /Statistics /Physics with ME/MTech/PhD degree in Computer Science	(ii) **Large-scale omics data analysis/algorithm development** *Large-scale genomic data analysis with demonstrated experience of developing algorithmic/AI/ML methods for next-generation sequence genomics / transcriptomics with applications to diseases and systems genetics.*

	Biotechnology	d) BE / BTech in Chemical Engineering (preferably) / Biochemical Engineering / Biotechnology / equivalent.	(iii) **Synthetic biology for green manufacturing/Downstream processing for recombinant therapeutics** *Bioprocess engineering with demonstrated experimental expertise in at least one of the following specializations:* - Synthetic biology/Metabolic engineering and Bioprocess development for green manufacturing of industrial metabolites - Cell-line engineering/Downstream processing for recombinant therapeutics
		e) BE / BTech in Chemical Engineering (preferably) / Biochemical Engineering / Biotechnology / Materials Science and Engineering / Equivalent	(iv) **Data-driven or basic chemistry-inspired biomaterial design** *Biomaterials engineering with a focus on the following specializations* Data-driven or basic chemistry-inspired design and discovery of biomaterials.
3	**Chemistry**	a) Applicants must have their basic degrees in B.Sc. and M. Sc. (or M.S. as applicable) with Chemistry as the major subject of study and a Ph.D. degree in the field of Chemistry. b) A minimum of three years of active postdoctoral research experience. c) Teaching Requirement: Applicant should be able to teach UG and PG courses both at the core and elective levels of the respective chosen section [(i), (ii) and (iii) Physical Chemistry/ (iv) and (v) Organic Chemistry/ (vi) and (vii) Inorganic Chemistry].	(i) Heterogeneous catalysis with mechanistic understanding of chemical processes using operando techniques with demonstrated experience in energy and environment-related practical applications/process development. (ii) Experimental multidimensional ultrafast spectroscopy (vibrational/electronic): structure, dynamics and transient properties of biomolecules/nanostructures/solids. (iii) Structure-property correlations using advanced techniques such as cryogenic electron microscopy (cryo-EM) and/or micro-electron diffraction (microED) to understand materials and interfaces at atomic detail (It is preferable that candidate has expertise to address problems related to energy and environment. Structural biologists with demonstrated knowledge of these techniques in materials science are also encouraged to apply) (iv) Total synthesis of natural products (v) Mechanistic and physical organic chemistry (vi) Synthetic inorganic solid-state chemistry of transition metal and main group elements (vii) Transition metal bioinorganic chemistry (preferably non-heme systems)

4	**Civil Engineering**	Basic degree in Civil Engineering* * Exceptional candidates with basic degree in allied areas will be considered in the following areas: Infrastructure and Construction Management	(i) Geosynthetics, (ii) Computational Geomechanics for Nonlinear Modeling (iii) Infrastructure and Construction Management
		At least one degree in Civil Engineering	(i) Pavement Engineering and Management - Advanced Bituminous Material Characterization, Design of Bituminous and Concrete Pavements, Non-destructive testing of Pavements, and Pavement Management System (ii) Traffic Engineering and Transportation Planning: All areas of Traffic Engineering and Transportation Planning with specific interest in: Transit and Shared Mobility Electric, Connected, and Autonomous Mobility Non-motorized Transport Transportation Economics Transportation safety studies focused on human factors, geometric design and driving behavior
5	**Computer Science & Engineering**	Specific Qualification*	All areas of Computer Science and Engineering

Specific Qualification*

- **Bachelor's Degree**: Candidates must have an engineering degree in Computer Science / Computer Science and Engineering/ Computer Engineering.

- **Master's Degree**: Candidates must hold a master's degree in engineering from Computer Science / Computer Science and Engineering/ Computer Engineering program. [This may be waived if the candidate was admitted to a direct Ph.D. program after the Bachelor's degree.]
- **Ph.D. Degree**: Must be in Computer Science/ Computer Science and Engineering/ Computer Engineering.

Applications of candidates with deviations from the above qualification areas may be considered if they have an exceptionally good record of publications in areas related to Computer Science and Engineering.

6	**Electrical Engineering**	a) Candidates must have at least one degree in Electrical Engineering. (OR) b) Candidates may have degrees in Computer Science and Engineering / Physics, however, they must have a strong research record in the areas of interest to the Department of Electrical Engineering.	(i) Wireless Communications, Networks, Signal Processing, Machine Learning (ii) MEMS sensors and technology; GaN device technology; Technology for organic semiconductor devices (iii) Electronic System Design, Bio-Medical Instrumentation (iv) Analog, Mixed-signal, and RF IC design; Digital Systems Design and Architecture

7	**Engineering Design** *(Candidates should clearly indicate the area code that they are applying for: 1.1, 1.2, 1.3,1.4,1.5, 2.1, 2.2, 2.3, 2.4, iii, 4.1, 4.2).*	a) Bachelor's degree in an Engineering discipline and should have clearly demonstrated domain expertise in Automotive Engineering through the PhD or Post-Doctoral research work.	(i) Automotive Engineering: Candidates with demonstrated research experience during PhD or Post-Doctoral Fellowship in the following areas: 1.1) Sensor Technology with demonstrated application to Autonomous Road Vehicle Design. 1.2) Two-Wheeled Road Vehicle Design. 1.3) Battery Technology with demonstrated application to Electric Road Vehicle Design. 1.4) Electric Machine Design with demonstrated application to Electric Road Vehicle Design 1.5) Software Defined Vehicles with demonstrated application to Road Vehicle Design
		b) Bachelor's degree in Engineering Design / Electrical / Electronics / Instrumentation / Mechanical / Biomedical Engg.	(ii) Medical Device Design and Development: Demonstrated research experience during PhD or Post-Doctoral Fellowship, in developing hardware for the following applications- 2.1) Surgical Devices 2.2) Diagnostic Devices 2.3) Therapeutic Devices 2.4) Critical Care Devices
		c) Bachelor's degree in an Engineering discipline and should have clearly demonstrated domain expertise in Robotics Engineering through the PhD or Post-Doctoral research work	(iii) Robotics: Demonstrated research experience during Ph.D. or Post-Doctoral Fellowship in the design and implementation of control for soft robots, continuum robots, and legged locomotion
		d) Bachelor's degree in Engineering Design / Electrical / Mechanical / Production / Design / Computer Science and Engineering / Industrial Engineering	(iv) Computational and Product Design: 4.1) Demonstrated research experience during PhD or Post-Doctoral Fellowship (including computational approaches) in Human Factors / Form Design / Aesthetics / Interaction Design 4.2) Demonstrated research experience during PhD or Post-Doctoral Fellowship in applied topology optimization / biomimetic design.
		Research experience in the advertised areas during PhD or Post-Doctoral Fellowship should be clearly demonstrated by the candidate through appropriate publications as the First Author.	
8	**Humanities & Social Sciences**	Ph.D. in related domain	(i) Development Studies (Political Economy); Anthropology; Sociology; Political Science; and Urban Studies (ii) Philosophy of Science; IKS - Indian Grammatical Tradition (iii) Economic Theory (Macro, Game Theory, Behavioural and Experimental Economics)

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9	Management Studies	a) PhD/Doctoral research in Information systems	(i) Information systems
		b) PhD/Doctoral research in marketing Management	(ii) Marketing Management *Retailing, Services Marketing, AI and New Technologies in Marketing, Marketing Analytics*
		c) PhD/Doctoral degree in Finance	(iii) Finance *Quantitative Finance*
		d) PhD/Doctoral degree in HRM	(iv) Human resources Management & Organisation behaviour *HRM and International HRM*
10	Mathematics	Ph.D. in Mathematics/Statistics *Applicants with PhD in a subject other than but related to mathematics/ statistics may be considered, provided they have an exceptionally strong record of publications in reputed mathematics journals*	(i) All areas of Mathematics / Statistics
11	Mechanical Engineering	Any one degree in Mechanical Engineering	(i) Design, development, and integration of micro-nano systems (ii) Bio-microfluidics (iii) Micro-nano particulate systems (iv) Noise, Vibration, and Harshness (v) Vehicle Dynamics and Control (vi) Hydrogen Combustion Engines and Fuel Cells (vii) Advanced materials (viii) Internal Combustion Engines (ix) High-Performance Computational Mechanics (x) Robotics, Control and Automation (xi) Material Processing for Electronics/ Semiconductors/ Plastics (xii) Theoretical and Applied Mechanics (xiii) Hydrogen generation-storage-utilization technologies (xiv) Non-fossil energy technology (xv) Carbon capture and sequestration (xvi) Water Technology: Wastewater and potable water (xvii) Automation of farm equipment and machinery for sustainable agriculture (xviii) Instabilities, Transition, and Turbulent Flows (xix) Turbomachines (xx) Thermal management of electronics and battery systems (xxi) Flow and heat transfer through granular and porous media

			xxii) Biomechanical Engineering /Biomechatronics /Biorobotics Engineering /Rehabilitation Engineering xxiii) Biomechanics xxiv) Exceptionally meritorious candidates in any area of specialization may also be considered.
12	**Metallurgical and Materials Engineering**	At least one degree (Bachelor's/Master's degree) in Metallurgical or Materials Engineering.	(i) Sustainable metallurgical technologies (recycling, green technologies for nonferrous metal extraction and urban mining)
13	**Ocean Engineering**	Ph.D relevant to Ocean Engineering / Naval architecture. Possess excellent academic record with first degree in engineering in Naval Architecture/Civil/ Mechanical /Ocean/Aerospace/Aeronautical Engineering.	(i) Ship structures; Ship design & Ship building; Ship Motion/Manoeuvring; Ship hydrodynamics; Autonomous and Green ships; Marine Engineering. (ii) Offshore structures; Harbour & Coastal structures; Offshore and Deepwater Engineering; Instrumentation in Ocean Engineering
14	**Physics**	Ph. D. in relevant fields	(i) Experimental Atomic and molecular physics *Candidates with a focus on atomic and molecular interactions with photons/electrons/ions in gas-phase and cold-atom physics are invited to apply. We expect the candidate to have skills in building their own atomic and molecular physics experimental setup.* (ii) Experimental Quantum Optics / Photonics with applications to quantum science and technology.
15	**Medical Sciences and Technology**	a) Applicants must have earned a doctorate in Medicine/Engineering/Sciences; b) All positions require experience in conducting basic and applied research and conducting clinical studies in direct collaboration with a hospital/medical school for at least two years. c) Must demonstrate an excellent publication record; exhibit potential to lead and establish a strong externally sponsored research program; and must be committed to excellence in teaching at both undergraduate and graduate levels.	(i) Mathematical modelling in physiology covering one or more of the following fields – Neurology including auditory neuroscience and other related areas, Cardiovascular and respiratory physiology, Nephrology, Gastroenterology, musculoskeletal system and related areas (ii) Organ specific medical imaging such as cardiac, neuro, respiratory, fetal etc. - analysis and clinical specific research (iii) Organ specific device developments including implants and artificial organs - Cardiac, Neuro, Nephrology, lung etc. (iv) Machine learning in medicine with demonstrated clinical applications (v) Clinical research including clinical biomarker, personalized medicine and targeted therapy (vi) Quantitative pharmacology.

| 16 | **Data Science and Artificial Intelligence** | a) Candidates must clearly demonstrate their capability in the specialization area applied for through publications in relevant reputed venues
and
b) PhD in Engineering / Sciences | (i)   Natural Language Processing
(ii) Speech Technologies
(iii) Computer Vision
(iv) Theoretical Machine Learning
(v) Agent-based AI |