

Areas of Research for Doctor of Philosophy (July 2026 Admissions)

Academic Division (Department/School/ Centre)	Specialization	Areas of Research	Link to Dept./ Centre/ School
Computer Science and Engineering	Computer Science and Engineering	Artificial Intelligence, Interpretability of AI and ML Models, Explainable AI, Deep Learning, NLP, Speech Processing, Generative AI for Vision and Multimodal Modelling, Agentic AI for Vision, Augmented/Virtual Reality, Human-Computer Interaction, Edge and Cloud Computing, Software Defined Networking, IoT, Intelligent Transportation Systems, 5G and IoT Security, Hardware Security, Controller Synthesis and Games, Formal Verification, High-level Synthesis, Microfluidic Design Automation, ML for Electronic Design Automation, Hardware Acceleration, Multicore Architecture, Memory Systems, Near-memory Computing, Disaggregated Compute Systems, Data Structures and Algorithms, Distributed Algorithms, Randomization and Approximation Algorithms, Graph Algorithms, Parameterized Algorithms, Optimization, Computational Geometry.	<u>CSE Department</u>
Electronics and Electrical Engineering	Communication Engineering	Wireless Communications; Information Theory and Coding; Communication Networks; Quantum error correction; Quantum computation and communication; Waveform design for wireless communications; Vehicular communications; 5G/6G Wireless communication: Massive MIMO, Cell-Free Massive MIMO, Orthogonal Time Frequency Space (OTFS) Modulation, Intelligent Reflecting Surfaces (IRS), Integrated Sensing and Communications (ISAC), Rate Splitting Multiple Access (RSMA); AI/ML application in communications; Adversarial machine learning; Blockchains and Cryptocurrency Technologies; Generative AI for Physical Layer Communications, Terrestrial and non-terrestrial (satellite, UAV etc) communication and networking	<u>EEE Department</u>
	Power Engineering	Power Systems; Power Electronics; Power Quality; Power electronics application in power system; Micro grid and renewable energy resources; Power distribution system planning; Custom power devices; Electrical Machines; Control of Electrical Drives; Smart Grids and Electric Vehicles; High Voltage Engineering; High Voltage Engineering and Applied Electromagnetics; Condition Monitoring of Power Apparatuses; High voltage and Pulse power; High power density motor design; Inductive charging for EVs; Vector Control of Motors; Power system Monitoring and Control; Power System Cyber-Security; Decentralized Control for the Smart Grid, Fuel Cell-Battery hybrid energy systems.	

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	Microelectronics, Photonics and RF Engineering	Microelectronics; Solid-State Devices; Semiconductor Devices; Optical devices; Fiber Optic Communication; Optoelectronics; Photonics Integrated Circuits; Silicon photonics; Optical Communication; Optical Networks; Optical Sensors; Nanophotonics; Biophotonics; Photonic Computing; Lidar; AI/ML- Assisted Photonic Design; Distributed Acoustic Sensors; Microwave and Photonics; Quantum Photonics; Optical Instrumentation; Programmable Photonics; Plasmonics and metamaterials and smart electrotuneable plasmonic metasystems; Structural Health Monitoring Using fiber Optics; Optical Signal Processing; Digital Holography; Phase Imaging; Laser Speckle Imaging, Fringe Projection Profilometry, Interferometry; Photonics and Metamaterial device design using AI; Metamaterials for MRI; Antenna; Microwave Engineering; Electromagnetics; Computational Electromagnetics. Reconfigurable Metasurfaces; TeraHertz Photonic Topological Insulators; Metamaterials and Metasurfaces for Advanced photovoltaics and Light emitting diodes; Antenna; Microwave Engineering; Electromagnetics; Computational Electromagnetics; Vacuum Electronics; Millimeter-wave Communication.	
	Signal Processing and Machine Learning	Data Sciences; Biomedical Signal and Medical Image Processing; Speech and Handwriting Processing; Image/Video Processing and Computer Vision; Pattern Recognition; Multimedia Analytics; Biometrics; Counter-spoofing; Security and Privacy; Biometrics and Biometric counter-spoofing; Privacy preserving analysis for secure computation; Secure key distribution and management in wireless sensor networks; Video Analytics; Vision and Language; Natural Language Processing; Deep Learning, Fake image, video and audio detection	
	Systems, Control and Automation	Systems Theory; Control Theory and Applications; Control of Nonlinear Uncertain Systems; Artificial Intelligence based Control; Identification and Control of Nonlinear Systems; Relay Based Identification and Autotuning; Adaptive Control; Optimal Control; Robotics and Automation; Cryptography; Robust Control; Cooperative Control of Multi-agent Systems; Decentralized Control for Smart Power Grid Applications; Model Predictive Control; Reinforcement Learning; Vibration control of flexible structures; Modelling and control of mechatronic and robotic systems; Multi-agent systems and Cooperative control; Group- coordinated control of UAVs; UGVs and AUVs; Connected Vehicle Platooning; Passivity- based control and Dissipativity; Negative-imaginary systems theory; Robust control of missiles; spacecraft and rockets; Smart and Microgrid control using a multi-agent framework; Controller Design for Energy Management System in Electric Vehicles.	

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	VLSI and Nanoelectronics	Solid-State Devices; Analog and RF Integrated Circuits; Digital Systems; DSP Architectures; CAD for VLSI; High Performance Computing; MEMS; Organic Electronics; Flexible Electronics; Instrumentation; Quantum Computing; Hardware Security; Sensors; Non-volatile memory technologies; Spintronics; Power Semiconductor Devices; Photodetectors; VLSI System Design; Embedded System Design; Computer Architecture; Neuromorphic Computing; In-Memory Computing; Hardware Realization of Machine Learning Algorithms; Magnetic random-access memory (MRAM); Magnetic Tunnel Junctions (MTJ); Advanced data storage technologies; Neuromorphic devices; ; Wearable Sensors; Electronic Nose; Papertronic Sensing Systems; and Sensor Interface Electronics; Quantum Photonics; Wide Bandgap semiconductors; Reliability; Photovoltaics; Energy Devices for Green Hydrogen; SAW Devices; Quantum Sensing Devices; Semiconductor Packaging Technologies; Low-Dimensional Semiconductor Devices; Single Electron Transistors; Single Photon Emitters and Detectors; Nano- Bioelectronics; Light Emitting Diodes and Transistors; Transient Electronics.	
Mechanical Engineering	Machine Design	Machine Design; Vibrations; Solid Mechanics; Data-driven material modelling; Modelling of heterogenous materials; Rehabilitation Robotics; Robotic Neurorehabilitation; Quantum Computing in Computational Mechanics; Multi-Disciplinary Design and Optimization; Operations Research; Multiscale Modelling of Composites; Micromechanics and Homogenization; Application of Machine Learning in Material Modelling; Rotor Dynamics; Condition Monitoring of Machinery; Polymer Composites; Natural Fiber Reinforced Composites; Predictive Maintenance; Generative Design; Digital Twin in Machine Design; Electromagnetics; Functionally Graded Material Fabrication; FEM in Acoustics, Electromagnetics and Structures; Optimization, Structural Optimization; Biomedical Devices, Assistive Devices, Rehabilitation Engineering, Biodesign; Fatigue Fracture in Metals, Polymers, and Composites; Solid State Battery Modelling and Analysis, PZT Actuator and Sensor Fabrication, Bamboo Composites	<u>ME Department</u>

Academic Division (Department/School / Centre)	Specialization	Areas of Research	Link to Dept./ Centre/ School			
	Manufacturing and Materials	Manufacturing Engineering; Metal Additive Manufacturing Technologies; CAD /CAM; Mechanical metamaterials; Impact energy absorbing materials; Metallurgy of 3D-printing; Natural Fiber Reinforced Composites; Polymer Composites; Repairing of underwater structures using composites; AI and ML in Machining Processes; Modelling of Manufacturing Processes; Digital twin in manufacturing; Composite Machining; Additive Manufacturing; Electromagnetic Forming; Electromagnetic Crimping; Dynamics in machining processes; Welding; Micromachining and micromanufacturing; Sustainable material design; Laser based manufacturing processes; Automation in manufacturing, Advanced Machining Processes, sheet metal forming, sheet metal joining				
	Fluids and Thermal	Droplet-based microfluidics, Microscale PIV analysis of single/multi component flows, Flow through plants, Analysis of flow-induced stress on plant roots, Experimental investigation of flow-induced vibrations and its application in renewable energy, Development of in-house flow measurement devices such as PIV and LDA, Development of a microfluidic device for sustained drug release in cancer theranostics, Formation and manipulation of ferrofluid droplets by external field, Numerical investigation of flow-induced vibrations, Development of fluid-structure interaction solver based on spectral-element method, Supercritical heat transport system, Multiphase flow simulation using Lattice Boltzmann method, Investigation of MHD turbulence via Direct Numerical Simulations (DNS) and Large Eddy Simulations (LES), Investigation of explosive instabilities in tokamak plasmas relevant to fusion energy generation; Effect of Water and Light on Health: affordable healthy drinking water, Ordered Water and its Disease-curing Capacity, Biomimetic Extreme-wetting Surfaces and Their Applications from Energy to Health.				
Civil Engineering	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Environment Engineering</td> </tr> <tr> <td style="padding: 2px;">Geotechnical Engineering</td> </tr> <tr> <td style="padding: 2px;">Infrastructure Engineering & Management</td> </tr> </table>	Environment Engineering	Geotechnical Engineering	Infrastructure Engineering & Management	(For Civil Engineering Department, Sub-Area is not required to be filled in the application form)	<u>Civil Engineering Department</u>
Environment Engineering						
Geotechnical Engineering						
Infrastructure Engineering & Management						

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	Structural Engineering Transportation Engineering Water Resources and Hydraulic Engineering Earth System Science and Engineering.		
Biosciences and Bioengineering	Biosciences and Bioengineering	All Areas of Biosciences and Bioengineering.	BSBE Department
Chemical Engineering	Chemical Engineering	Materials Science and Engineering; Colloid and Interface Science; Catalysis, Photocatalysis & Electrocatalysis; Process Intensification; Microfluidics and Optofluidics; Energy Science and Technology; Green Hydrogen; Biological Physics; Bioengineering; Biomass Pyrolysis; Lignocellulosic Biomass and Microalgae Biorefinery; Artificial Intelligence/Machine Learning/Data Science; Micro/Nano Science and Engineering; Environmental Science and Engineering; Petroleum Science and Engineering; Petrochemicals; Petroleum Refinery; Process Control; Multiphase flow; Advanced Computing (Molecular dynamics, Multiscale simulations, CFD, Optimization); Computational Bioscience; Quantum Chemistry; Food Science and Technology; Polymer Science and Technology; Fluid-structure interaction; Droplet/particle dynamics; Carbon Capture utilisation and storage (CCUS); Membrane Separation and Technology; Waste-to-Energy Technologies; Explainable AI (XAI) and Trustworthy AI in Process Industries	Chemical Engineering Department
Design	Design	Visual Communication (Including Art & Visual Culture, Semiotics, Colour, Typography, Grids, Signage Design, Graphic Design, Illustration, Animation, Multimedia, Film & Video, Visual Narratives); New Media; Design Management, Design Strategy, Product-Service-Systems (PSS); Service Design; Design For Sustainability; Design for Social Innovation; System Design; Product Design and Development; Product Aesthetics; Form Design;	Design Department

Academic Division (Department/School/ Centre)	Specialization	Areas of Research	Link to Dept./ Centre/ School
		Human Centered Design of Emerging-Technology-Based Products; Design Cognition; Understanding/Supporting Design Processes in Various Disciplines; Design and Culture; Makerspaces; Participatory Design; Co-creation; Frugal Design and Engineering; Frugal Innovation; Inclusive Design; Design For Health and Well Being; Human Computer Interaction (HCI); Interaction and Usability Engineering; Virtual Reality (VR); Voice And Conversational User Interfaces; Assistive Interfaces; User Interaction On Flexible Displays; Deformation Based Input Methods; Information Communication Technology For Development (ICTD); Input Methods for Digital Interfaces; Ergonomics (Including Occupational Health And Safety); Design Creativity and Innovation Studies; Design Education and Pedagogy; Design for Smart Cities; Design for Children; Toy Design; Electronic Product Design; Sound Design and Sonic Studies; Speculative Design; Furniture Design; Packaging Design; Automotive Design; Design for Additive Manufacturing (DfAM).	
Physics	Physics	Condensed Matter Physics – materials physics, AI/ML based modelling of materials for energy storage, energy harvesting and environmental applications; experimental and theoretical studies on ferroelectric and oxide materials, graphene and analogue atomic thin materials, organic semiconductors, semiconducting materials, metal halide perovskite materials, photo-physics, thin film semiconductor devices, solar cells, LEDs, LASER Diodes, flexible devices, topological and low-dimensional quantum materials, electronic transport properties, imaging, smart magnetic materials, multiferroics, Luttinger liquids, soft condensed matter, spintronics, statistical physics, random walk, percolation, porous media, climate physics, network, self-organization, active matters and collective motion, nonequilibrium statistical mechanics, hydrodynamics, quantum turbulence and nonlinear instabilities in BEC, strongly correlated systems, superconductivity, topological insulators, Skyrmions, open quantum systems and quantum chaos, quantum turbulence, quantum phase transitions, ultracold atoms in optical lattices, nanomaterials and nanotechnology, polymer physics, AdS/CMT, magnetohydrodynamics, Luttinger and non-Fermi liquids, Bosonization, Machine learning in Physics, biophysics. Gravity, Astrophysics, and Cosmology – classical & quantum aspects of gravity, cosmology, and astrophysics – black hole physics, black hole perturbation, modified gravity in context of astrophysics and cosmology, theoretical cosmology, Early universe magneto-hydrodynamics (MHD), astrophysical flows around compact objects, X-ray astronomy of black hole X-ray Binaries, ultra high energy cosmic rays, black hole thermodynamics, quantum field theory on curved spacetime, Hawking-Unruh effect,	Physics Department

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		<p>Quantum information under relativistic regime as well as curved backgrounds, Relativistic fluid and its thermodynamics in presence of gravity, Quantum aspects of gravitational waves.</p> <p>High Energy Physics – Theory and Phenomenology: dark matter phenomenology, neutrino physics, heavy flavor physics, collider phenomenology, QCD, precision calculations in the Standard Model and beyond, aspects of CP violation, matter- antimatter asymmetry, astro-particle physics/cosmological connections, inflation, effective field theory in particle, nuclear and cold atomic physics, physics of exotic nuclei and hadrons. Experimental Particle Physics: B-physics at Belle and Belle II and neutrino physics at NoVA and DUNE. Neutrino astrophysics: Supernova neutrinos, ultra high-energy neutrinos.</p> <p>Laser and Photonics – fiber Optics, localized surface plasmon resonance, optical fiber sensors for structural health monitoring and environmental engineering, laser- Matter interaction, nonlinear optics, quantum optics, free space optical communication, Single beam optical trap, super-resolution imaging, terahertz plasmonics and metamaterials, plasmonics materials, laser-induced breakdown spectroscopy, and plasma spectroscopy, Thermal photonics, Integrated photonic devices, Quantum optoelectronics, Multi-spectral and Hyperspectral Imaging, Soft-photonics, Bio-photonic sensors, 2D polaritonics, Integrated Quantum Photonics, Laser Micromachining, Quantum Sensing with Color Centers.</p> <p>Quantum Optics and Quantum Technology – cavity quantum electrodynamics, circuit QED and quantum optomechanics, Cold atom-based quantum computer, Coherent control of vector beam propagation, Coherent Control of Macroscopic Quantum Systems, Coherent Control of Topological Photonics, coherent manipulations of atomic superposition, quantum sensing with cold atoms.</p>	
Chemistry	Chemistry	All Areas of Chemistry.	Chemistry Department
Mathematics	Mathematics:	Functional Analysis and Operator theory, Complex Analysis, Harmonic Analysis, Numerical Analysis, Differential Equations, Fluid Dynamics, Mathematical Biology	
	Probability, Statistics and Finance	Probability and Stochastic Processes, Stochastic Models, Queueing Systems, Financial Time Series, Mathematical Finance, Statistics, Biostatistics, Data Privacy, and Machine Learning.	Mathematics Department

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	Computer Science:	Algorithms and Data Structures, Approximation Algorithms, Graph Algorithms, Distributed Algorithms, Machine Learning–Driven Network Security and Networks.	
Humanities and Social Sciences	Archaeology:	Archaeological sciences, prehistoric archaeology and Historical archaeology	HSS Department
	Development Studies:	Rural & urban labour market, Scheme workers, Agrarian issues	
	Economics:	International Trade, Labour Economics, Development Economics, Economics of Climate Change, Environmental Economics, Industrial Organization, Applied Game Theory, Loss and damage, International trade and environment, Agricultural economics, Urban-Rural Labour Market, Secondary and higher education, Food security, Government welfare programmes, Public Finance, Fiscal Federalism, Political Economy	
	English:	Digital textual studies, Literature of the early modern world (1500-1700), Modern South Asian/ Indian literatures, Gender and sexuality studies, and the novel/modern poetry	
	History:	Social and Religious Transitions in Modern South and North-East India, Literary History of Pre-colonial Assam, and Environmental History of India	
	Linguistics:	<ol style="list-style-type: none"> 1. Phonology & phonological processing, prosodic aspects of atypical learning, tone and intonation in languages, especially Tibeto-Burman and Indo-Aryan languages 2. Language processing, sociolinguistics of north eastern languages, bilingualism. cognitive linguistic study of languages (with special focus on north-eastern languages) 3. Acoustic phonetics, Phonetics of tone languages, Phonetics of Tibeto-Burman languages 	
	Philosophy:	Local knowledge, values in science	
	Psychology:	Positive psychology, Health psychology, Experimental psychology, Cognitive psychology	
	Political Science:	Ethnic mobilization, Electoral campaigns and violence	
Sociology:	Sociology of Food, Sociology of Religion, Religion and Aesthetics, Sociology of Gender (Gender & Law)		

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Energy Science and Engineering	Energy Science and Engineering	<p>All the areas related to renewable energy, clean coal technology, biofuels (Biodiesel, Bioethanol etc.), biolubricants, gasification, biomass pyrolysis, microalgae, internal combustion engine, energy efficiency and advanced energy storage systems, green hydrogen through electrolysis, battery thermal management system (BTMS), green building and energy management, fuel cell and electrocatalysts, CO2 to methanol, bio-oil via CTL, solar thermal, energy material synthesis, batteries and supercapacitors. Solar photovoltaics, fabrication, characterisation & numerical modeling of Perovskite solar cells.</p> <p>Power electronics application in power system; Power system monitoring and Control; Control of Power Electronics Interfaces for Distributed Energy Resources and Microgrids. EV charging infrastructure, electronic design, energy computation and simulation, device fabrication, integrated energy systems, and multigeneration energy systems, energy modelling, AI and energy optimization, Power Systems.</p>	School of Energy Science and Engineering
Agro and Rural Technology		<p>Engineered nano-Biochar & its applications, Microbial technologies for soil quality improvement, greenhouse gases management in agro-ecosystems; Climate Smart Agriculture, Microbial technologies for soil quality improvement, Optimization and characterisation of valorised biomaterials; Food process engineering and new product development; Thermoelectric Devices, Advanced Cook stove Design and Testing, Emission Testing, Solar PV, Biomass and Bioenergy, Renewable Energy based Device Design, IOT, Isothermal drying of agricultural products, Food Biotechnology (for paper-based detection); Pollution load assessment of wastewater, Wastewater treatment using different technology and its design, Vermicompost/compost for disease suppressive ability, nutrient dynamics in composting/co-composting, Effect of compost on soil quality; Remote sensing for cropland monitoring; spatial planning and geo-intelligence in agro-rural sector; Agribusiness Management, Agribusiness Incubation, Agricultural Supply Chain Management, Business Model Innovations, Entrepreneurship Development, Application of Artificial Intelligence, Machine Learning, Blockchain Technologies in Agri and allied sectors.</p>	School of Agro and Rural Technology
Mehta Family School of Data Science and Artificial Intelligence	Data Science and Artificial Intelligence	<p>1. Artificial Intelligence, Machine Learning, and Deep Learning Algorithms and their applications to Computer Vision: Object detection, Classification, Identification,</p>	

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		<p>Recognition, Image enhancement, Image matching; Equitable Precision Medicine: Transfer learning, Meta-learning, Few-shot learning; and Condition-based Monitoring: Fault diagnosis and Remaining useful life prediction.</p> <p>2. Computer Vision using Deep Learning and Machine Learning, Adverse Weather Image/Video Restoration, Object Detection and Tracking, Scene Perception/Understanding</p> <p>3. Optimization and Control of Stochastic Systems, Resource Allocation in Next-generation Wireless Communication Networks (5G/6G), Reinforcement Learning, Application of Machine Learning in Wireless Communication, Markov Decision Process, Multi-armed Bandit, Internet of Things (IoT), Federated Learning.</p> <p>4. Image processing: Biomedical image processing, Computer vision: Classification, segmentation, and tracking of the human eye, face, and hand, Computer graphics: Animation of human eye and face</p> <p>5. Machine Learning in Robotic Neurorehabilitation</p> <p>6. Speech, Audio, and Neural/Brain Signals: Modeling, Processing, Recognition, Generation, Multi-modal Approaches; Applications to scientific understanding, technology development, and healthcare. Speech modeling, recognition and understanding, Conversational speech modelling, Emotion-rich speech recognition and synthesis, Explainable AI for multimodal data processing and learning</p> <p>7. AI for Cognitive Science: Psychology-driven experiments, Modeling and Data- driven hypothesis testing</p> <p>8. AI/ML plus Physics</p> <p>9. Machine-learning based network security and privacy.</p> <p>10. Reliability, Statistical Inferences, Transfer Learning, Applications of AI and ML</p> <p>11. Statistical Signal Processing and Machine Learning, Non-linear regression, Time series analysis; Bayesian Inference in Signal Processing</p> <p>12. Quantitative Finance, Financial Analytics.</p> <p>13. Video Deep-fake Detection, Activity Recognition</p> <p>14. Network Medicine and AI in Healthcare, Systems Biology, Computational Biology</p> <p>15. TinyML (camera, radar, smell and tactile sensor ML), NeuroAI, Neuromorphic Engineering, Computational Neuroscience, Few shot learning, Continual lifelong learning.</p> <p>16. Quantitative Finance with AL-ML</p> <p>17. Climate Financial Risk and Analytics</p> <p>18. Sustainable Investment</p>	<p><u>Mehta Family School of Data Science and Artificial Intelligence</u></p>

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Jyoti and Bhupat Mehta School of Health Sciences and Technology	Biosensors and Biotechnology	<ul style="list-style-type: none"> • Nanotechnology and 2D materials • Drug-cell interaction and Nanobiotechnology • Optical and electrochemical Biosensors • Chemical Biology • Cancer therapeutics • Wound healing, Hydrogels and scaffolds 	Jyoti and Bhupat Mehta School of Health Sciences and Technology
	Computational Methods and Biomedical Signal Processing with AI/ML Approaches	<ul style="list-style-type: none"> • Machine learning and Biomolecular simulations • Genomics and transcriptomics analysis for stroke • AI/ML Methods for Biomedical Data and Signals • Feature Extraction and Pattern Recognition in Biosignals • EEG Signal Processing, Sleep Neurophysiology • Cardiovascular and Autonomic Signal Processing • Neuro-Musculo-Skeletal Digital Twins • AI-Driven Behavioral Phenotyping • Deep learning for cross-modal medical diagnosis • Computational neuroscience • Medical Informatics 	
	Biomedical Instrumentation and Engineering	<ul style="list-style-type: none"> • Biomedical Instrumentation and Electronics • Circuit Design/RF Engineering for wide range of MRI applications • Hardware Development for Next-Generation MR Imaging Systems • POC MRI diagnostic instrument design • Biomedical devices and sensors • Structural analysis of biomedical devices for intracranial treatment 	
	Biomaterials	<ul style="list-style-type: none"> • Functional polymers • Artificial Mucus • Self-healing Hydrogels • Virus inhibitors • Single-chain nanoparticles • Mucosal drug delivery 	

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	Biomechanics and Mechanics of Soft Materials	<ul style="list-style-type: none"> • Cell and Tissue Mechanics • Soft Robotics • Mechanics of Self-healing and Bio-printable Materials • Growth and Remodeling in Living systems • Cell-Substrate Interactions • Material characterization and Constitutive Modelling of soft and living materials. 	
	Biomicrofluidics (Experimental and Computational Approaches)	<ul style="list-style-type: none"> • Microfluidics • Point-of-Care (POC) and Lab-on-a-Chip (LoC) Devices • Biofluid Dynamics • Physiological Flows • Growth and Nutrient Transport in Biofilms • Soft Biological Systems • Hemodynamics • Biofluid dynamics for pediatric stroke and moyamoya disease 	
	Assistive Devices & Rehabilitation Engineering	<ul style="list-style-type: none"> • Rehabilitation Engineering • Sports Science • Digital Healthcare Systems 	
School of Business	Business	Marketing, Strategy, Entrepreneurship, Policy and Innovation Management, Operations Management (services, platforms, decision sciences), Macroeconomic Policy, Open Economy Macroeconomics, Financial Economics, Organizational Behaviour & Human Resource Management, Finance & Accounting	<u>School of Business</u>
Environment	Environment	<ul style="list-style-type: none"> • Water and industrial wastewater treatment technologies (membrane separation, AOPs, physicochemical methods, microalgal and microbial processes, etc.) • Groundwater treatment (arsenic, fluoride removal, etc.) • Solid waste management and valorization • Eco-system services and valuation • Nanomaterials and biomaterials for environmental applications (sensor development, catalysis, adsorbent development, healthcare, antimicrobial activity, water treatment, etc.) 	<u>Centre for the Environment</u>

Academic Division (Department/School/ Centre)	Specialization	Areas of Research	Link to Dept./ Centre/ School
		<ul style="list-style-type: none"> • Environmental microplastics and its remediation • Atmospheric chemistry of oxygenated volatile organic compounds • CO₂ capture, separation, and production formation (electrochemical, photochemical, adsorption, membrane processes, and modeling & simulation studies) • Radical initiated reaction with CFC alternatives, QM/ MM studies on enzyme catalysis • Micro-nanobubble science and technology • Deep eutectic solvent (DES) and ionic liquids(ILs) • Extraction of sulphate ions from coal sludge using Ettringite precipitation • Molecular dynamics simulation of biological molecules • Prebiotic pathways in the extraterrestrial atmosphere • Environmental genomics of fungi • Bacterial isolation from nature and its uses • Semisynthetic organisms with expanded genetic codes for environmental applications, Membrane development for fuel cells • Intelligent integration of AI and IoT for air quality monitoring, Sustainable functional food • Biodiversity and wetland ecology 	
Nanotechnology	Nanotechnology	Nano/Bio Materials Science and Engineering; NanoTheranostic Devices; Nano/Bio-Electronics and Sensors; Experimental and Computational studies of micro- and nano-fluidics, Molecular Simulations; Polymer self-assembly; Polymer Nanocomposites; Nano Devices and Applications; Flow Chemistry; Catalysis for Energy; Energy Applications; All areas of Chemistry and Physics including Nanoscale Materials, Polymers, Optoelectronics, and Photonic applications; Nanoelectronic Devices: Non-Volatile Memory Devices and Technologies, Plasmonic Devices, Neuromorphic Devices, Low-Dimensional Semiconductors and Devices, Semiconductor technology, Spintronic Devices, Photovoltaics and Photodetectors; Green Hydrogen Generation: Organic, Hybrid, Flexible, and Printable Electronics; Bio-Inspired Wettability and Design of Water Repellent and Conductive Interfaces, Cancer nanotheranotics	Centre for Nanotechnology

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Linguistic Science and Technology	Linguistic Science and Technology	Natural Language Processing, Computational Phonology, Speech Analysis, Spoken Language Resources, Neuroimaging of Language disorders, Quantitative Phonetics, Natural User Interfaces, Vision and language, Vision and Speech, Document Image Processing, Virtual / Augmented / Mixed Reality, Neurocognitive response to live music with and without language	<u>Centre for Linguistic Science & Technology</u>
Disaster Management and Research	Disaster Management and Research	Structural health monitoring, Service Life Assessment of Structures, Low-cost housing; Sustainable construction materials; Vulnerability, adaptation and DRR in urban cluster; Transport (accessibility and disaster resilience); Earthquake ground motion characterization; Seismic resilience of structures; Seismic and blast-induced disasters; Design for disaster risk reduction; Gamification for Disaster Management; Landslide prediction and mitigation, mudflow/debris-flow; Disaster modeling using AI and Machine Learning; Deformation of metallic structures under crash loading conditions; Gender Perspectives in DRR; Non- equilibrium transport of pollutants in soil; Structural Health Monitoring & Reliability Analysis; Climate change Vulnerability & Adaptation assessment in flood and drought affected areas; Climate-smart agriculture; Community based Disaster Risk Reduction, Vulnerability & Adaptation assessment in flood and drought affected areas; Climate-smart agriculture; Community based Disaster Risk Reduction; B5G/6G for Disaster Management; IoT for Disaster Management.	<u>Centre for Disaster Management and Research</u>
Sustainable Polymers	Sustainable Polymers	All areas of Polymer Science and Engineering (including Organic electronics, Polymer liquid crystal, Polymer nanocomposites, Implant materials), Solid Waste Management, Agriculture, Biotechnology with Emphasis on Biopolymers, Monomers, Biocatalysis, Toxicology, Migration Studies, Polymer Ecology, Life Cycle Assessment, Polymer Product Design and Development, Organocatalyst, Organometallic catalysis, Green Chemistry. Natural Fiber Reinforced Composites; Polymer Composites; Sustainable Composites, Bio-composites, Recycling and Degradation of Polymer Composites, 3D Printing of Sustainable Composites.	<u>Centre for Sustainable Polymers</u>

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Indian Knowledge Systems	Indian Knowledge Systems	<ul style="list-style-type: none"> • History of Science, Technology, and Engineering in India; • Water conservation systems; • Home Construction Materials; • Vastu and Sidhanta/Samhita-Jyotisha • Temple Architecture; • Study of Instruments from Indian texts; • Science and Technology of Ksheerapaka extracts; • Ontological design; • Herbal/Ayurvedic Medicinal Products; • Integrative Medicine; • Psychology and Consciousness studies; • Meditation and Health; <p>Indigenous cultivation systems and Indigenous trade</p>	<u>Centre for Indian Knowledge Systems</u>
Intelligent Cyber Physical Systems	Intelligent Cyber Physical Systems	<p>Internet-of-Things (IoT), Sensors, Embedded Systems; Robotics, Control and Sensing: Modelling, Analysis and Design of Robotic Systems, Intelligent Sensing and Control for Autonomous Vehicles, Control of Swarm Systems, Sensor and Actuator Design; Artificial Intelligence: Machine Learning, Deep Learning, Computer Vision, Natural Language Processing, Speech and Audio Signal Processing, Biomedical Signal & Image Processing, Data Science and Analytics; Underwater Systems: Underwater Systems Design and Development, Underwater Exploration, Underwater Structural Analysis, Sonar and Underwater Acoustics, Compressed Air Energy Storage, Power Electronics for Underwater Systems, Underwater Concrete Printing; Biomechanics and Biomedical Devices; Smart and Intelligent Manufacturing: Robotics Manufacturing, AI and ML in Manufacturing Processes, Digital Twin of Manufacturing Systems and processes.</p>	<u>Centre for Intelligent Cyber Physical Systems</u>

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Centre for Sustainable Water Research	Sustainable Water Research	Hydrology and Water Resources Engineering (Surface Water; Groundwater; Atmospheric Water); Hydraulics; Socio-economic aspects of water; Water Economics; Water governance and policy; Transboundary water management; Sustainable Development of Water Resources; Remote Sensing and GIS application in Water Resources; Climate change impact, mitigation, and adaptation, Contaminant Transport; Water Filtration; Chemistry of nanomaterials for sustainable water; Waste Water Treatment; Pipe Networks; AI and ML applications in water research; and allied areas related to sustainable water research.	<u>Centre for Sustainable Water Research</u>
Centre for Drone Technology	Drone Technology	Autonomous Vehicles: Sensors, Embedded Systems, Control and Sensing, Design and development of Drones; Artificial Intelligence: Machine Learning, Computer Vision, Signal Processing, Image Processing; Underground Exploration, Remote Sensing and Geoinformatics (Geomatics), Geodesy, Atmospheric Science, Societal problems and mitigation.	<u>Centre for Drone Technology</u>
Manekshaw Centre of Excellence for National Security Studies and Research		<ol style="list-style-type: none"> 1. Radio Frequency (RF) Microwaves 2. Autonomous Systems 3. Sensing and Navigation Technology 4. Artificial Intelligence 5. Augmented Reality (AR) and Virtual Reality (VR) 6. Blockchain 7. Quantum Computing 8. Radar and Electronic Warfare 9. Satellite Communication 10. Stealth Technology 11. Additive Manufacturing 12. Blast Resistant Structures 	<u>Centre for Manekshaw Centre of Excellence for National Security Studies and Research</u>