

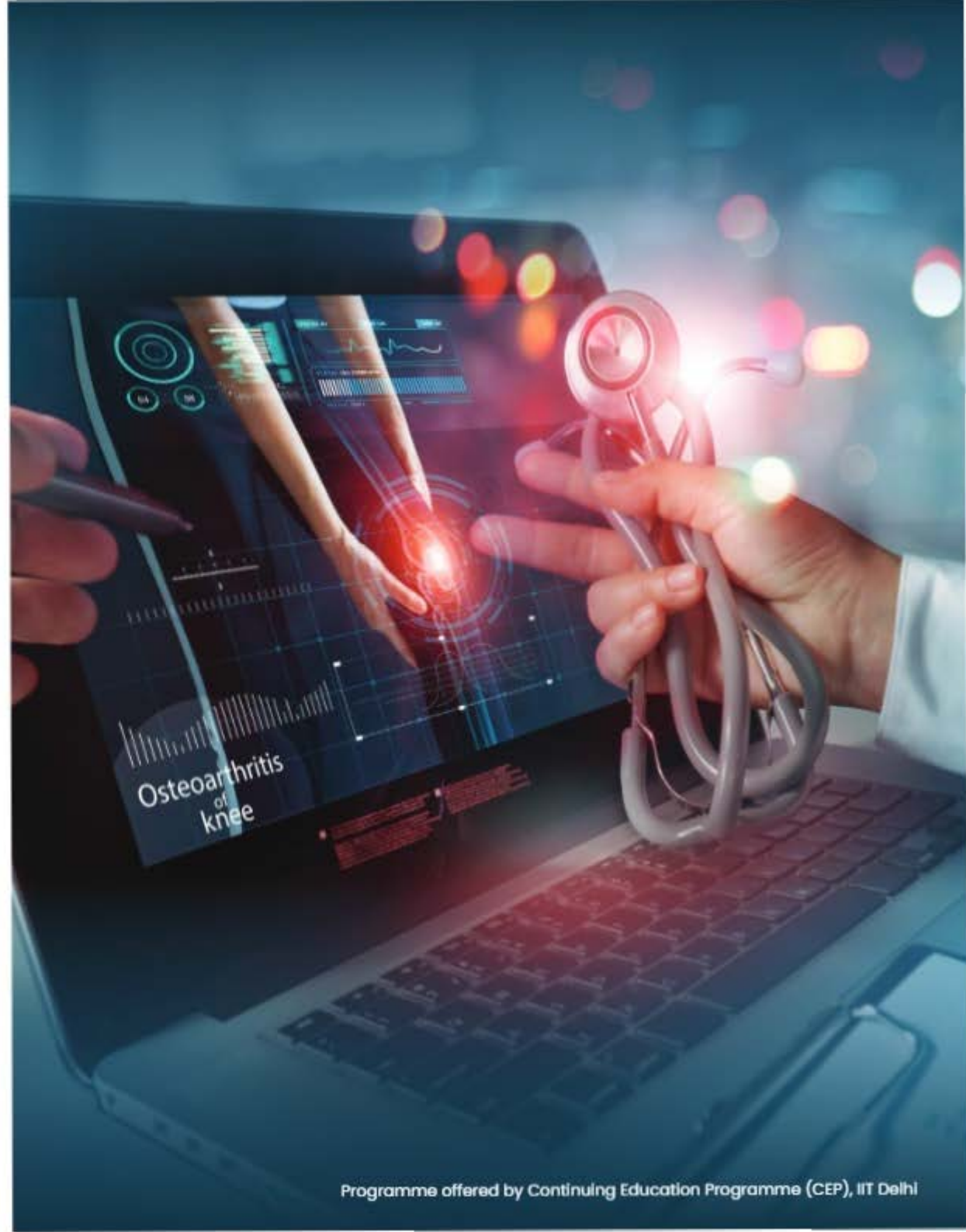


भारतीय प्रौद्योगिकी संस्थान दिल्ली
Indian Institute of Technology Delhi

Harnessing the Power of
Technology to Transform
Healthcare ▶

Executive Programme in
**Healthcare for
Industry 5.0**

Programme by CEP, IIT Delhi



Programme offered by Continuing Education Programme (CEP), IIT Delhi

Decoding Future of Industry 5.0 in Healthtech Innovation



Indian healthtech market is projected to reach **\$25 billion by 2025**, representing a doubling in size on account of factors such as rising internet penetration, the demand for enhanced accessibility, and the increasing prevalence of chronic diseases in the country.

*LoEstro Advisors | The Hindu Business Line

National Digital Health Mission (NDHM) will spur a fundamental transformation in India's healthcare system and unlock economic value worth over **\$200 billion by 2030.**

*NITI Aayog



Union Budget 2023-24 Snapshot:



- **INR 89,155 crore (US\$ 10.76 billion)** allocated to the Ministry of Health and Family Welfare, marking a 3.43% increase.
- **Focused Allocations:**

01 **INR 3,365 crore (US\$ 0.41 billion)**
Pradhan Mantri Swasthya Suraksha Yojana

01 **INR 6,500 crore (US\$ 780 million)**
Human Resources for Health and Medical Education

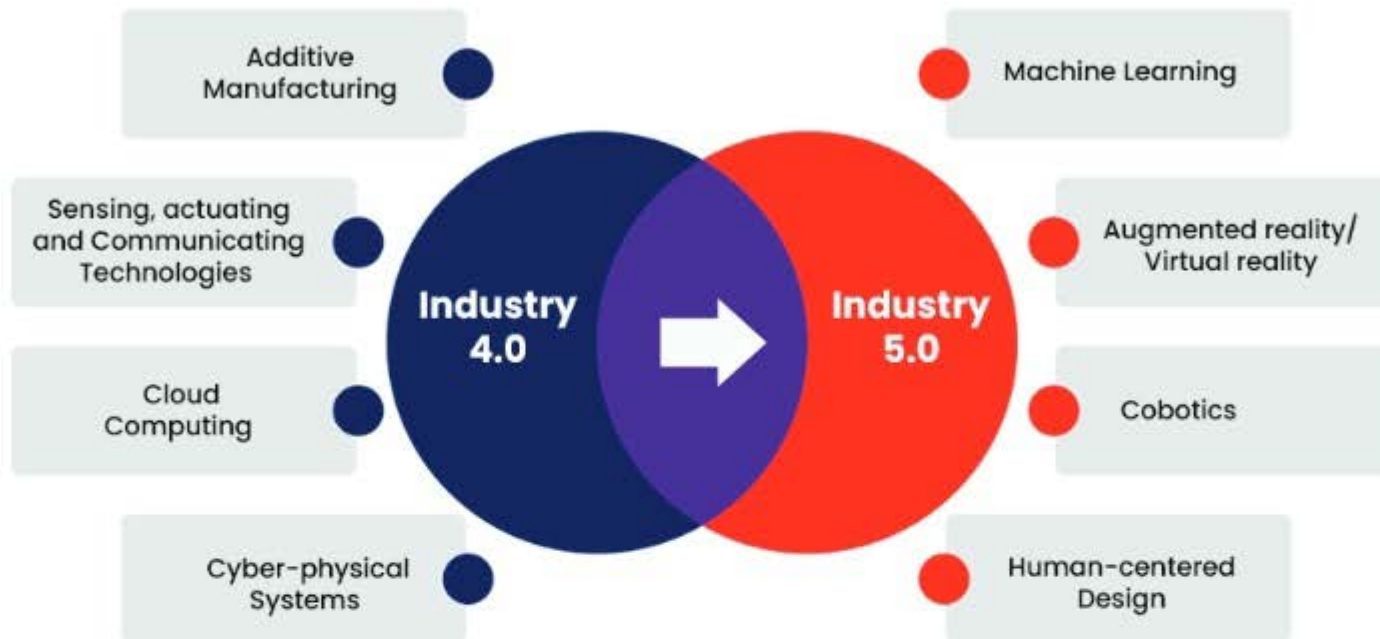
01 **INR 29,085 crore (US\$ 3.51 billion)**
National Health Mission

01 **INR 7,200 crore (US\$ 870 million)**
Ayushman Bharat – Pradhan Mantri Jan Arogya Yojana

- **Future Trends:**
 - **Diverse Opportunities:** The healthcare industry in India presents vast opportunities across various segments, attracting investments and fostering innovation.
 - **Consumer Shift:** Rising health consciousness and income levels are fueling demand for quality healthcare services and preventive measures.
 - **Government Vision:** With a vision to position India as a global healthcare destination, the government plans to increase public health spending to 2.5% of GDP by 2025.

References: DPIIT, RNCOS Reports, Media Reports, PIB, Union Budget 2023-24 | IBEF

Deciphering Industry 4.0 vs. Industry 5.0



In nutshell, while Industry 4.0 lays the groundwork for automation and digitalization, Industry 5.0 elevates manufacturing to a new paradigm where human ingenuity and technological prowess converge to unlock unprecedented levels of innovation, customization, and value creation. Industry 4.0 established the foundation for automation and digitalization through technologies like additive manufacturing, cloud computing, and cyber-physical systems. In contrast, Industry 5.0 transcends mere automation, embracing a paradigm where human creativity melds with advanced technologies such as sensing, communicating systems, and cobotics. This convergence unleashes unparalleled innovation and customization while fostering a symbiotic relationship between humans and machines. Augmented reality, virtual reality, and human-centered design further enhance this landscape, amplifying human ingenuity and enabling seamless collaboration in manufacturing. Industry 5.0 heralds a new era, where the fusion of human ingenuity and technological prowess drives exponential value creation and transformative industrial progress.

Programme Overview



The healthcare sector is on the brink of a significant transformation with the emergence of Industry 5.0, poised to transform healthcare by blending human and machine intelligence to establish a more personalized, sustainable, and robust healthcare system. To address this shift, IIT Delhi offers a comprehensive programme to equip healthcare professionals with the core knowledge, skills, and strategies needed to leverage the transformative potential of technology in healthcare. Through a mix of rigorous curriculum, industry insights, and practical experience, participants will be primed to navigate the complexities of Industry 5.0, foster innovation, and shape the future of healthcare provision. Join this intake to elevate your prowess in the dynamic healthcare and Industry 5.0.

Key Differentiators



Key Objectives



Understand the principles and concepts of Industry 5.0

01

Identify the key technologies shaping Industry 5.0 in healthcare

02

Explore the practical applications of Industry 5.0 technologies in healthcare settings

03

Develop strategies for implementing Industry 5.0 in your healthcare organization

04

Gain insights into the future of healthcare in the Industry 5.0 era

05

Learning Outcomes

- ▶▶ Understanding of Human Physiology to Pharma to Engineering for Healthcare
- ▶▶ Risk Management and Regulatory Approvals for MedTech Products
- ▶▶ Operations Management and Big Data Analytics for Healthcare
- ▶▶ Integration of AI, augmented reality and robotics leading to Industry 5.0





Human Physiology and Healthcare Fundamentals (Human Biomechanics and Space Biomechanics)

- **Human Physiology:** The study of how the human body works, including cells, tissues, organs, and systems.
- **Healthcare Fundamentals:** The basic principles of healthcare, such as anatomy, physiology, and pharmacology.
- **Human Biomechanics:** The study of the mechanical properties of the human body and how they affect movement, including the musculoskeletal system, biomechanics of gait, and biomechanics of sports.
- **Space Biomechanics:** The study of the effects of the space environment on the human body, including microgravity, radiation, and isolation.

Operations Management in Healthcare

- **Patient flow management and facility planning and layout:** Planning and coordinating the movement of patients through the healthcare system.
- **Resource management and Capacity planning for hospitals:** Ensuring that the right resources are available to the right patients at the right time, including staff, equipment, and supplies. Capacity planning for hospitals, Inventory management.
- **Quality improvement:** Implementing processes to improve the quality of care, including patient safety, patient satisfaction, and clinical outcomes.

Pharmaceuticals and Drug delivery

- **Pharmacokinetics:** The study of how drugs are absorbed, distributed, metabolized, and eliminated by the body.
- **Pharmacodynamics:** The study of how drugs interact with the body to produce an effect.
- **Drug delivery systems:** The route-specific delivery, recent strategies, biomedical polymers and sustained drug delivery.



Big Data Analytics in Healthcare

- **Predictive modelling:** Using data to predict future outcomes, such as readmission risk or patient mortality.
- **Treatment optimization:** Identifying the most effective treatments for individual patients based on their data.
- **Personalized care:** Tailoring care to the individual needs of each patient.

Industry 4.0

- **Fundamentals (upto Industry 3.0):** Various manufacturing processes, Just-in-time, Kaizen, Automation, and Control systems.
- **Sensing, actuating and Communicating Technologies:** Various types of sensors, actuators, wireless communications and PLCs.
- **Cyber-physical systems:** Integrating physical systems with digital systems to automate and optimize processes.
- **Internet of Things (IoT):** Connecting medical devices to the internet to collect and analyze data.
- **Additive Manufacturing:** Technologies for metal, polymer, ceramic and biological/ organic materials, Generative Design, Digital Inventory.
- **Cloud computing:** Storing and accessing healthcare data in the cloud.
- **Demonstration:** Generative Design, Haptic Devices for patient/subject-specific Medical Device Design, Additive Mfg., IoT-based 3D printing.

Industry 5.0 for Healthcare

- **Why Industry 5.0:** Reorganization costs, productivity, robots vs. cobots, advantages over Industry 4.0.
- **Human-centered design:** Human factors, design of workspaces, injury-prone zones, fatigue reduction.
- **Machine Learning:** Using AI to diagnose diseases, develop personalized treatment plans, and automate tasks.



- **Robotics:** Using robots to perform surgery, provide care, and assist with rehabilitation.
- **Augmented reality/ virtual reality:** Machine vision, haptics, virtual planning, gesture control.
- **Cobotics:** Advanced automation and control, (LIDAR, RADAR), Haptics, Human-machine Interface.
- **Blockchain:** Emerging technologies like blockchain in healthcare for secure data management and interoperability.
- **Demonstration:** Surgical cobots, cobots in packaging and assembly.

Corporate Responsibility in Healthcare

- **Environmental sustainability:** Reducing the environmental impact of healthcare operations.
- **Fair labor practices:** Ensuring that employees are treated fairly and compensated appropriately.
- **Community engagement:** Working with the community to improve health outcomes.
- **Ethics:** A section on healthcare ethics and privacy considerations in the era of advanced technologies.

Risk management and Regulatory approvals

- **Identifying risks:** Recognizing potential hazards that could harm patients, staff, or the organization.
- **Assessing risks:** Evaluating the likelihood and severity of potential risks.
- **Managing risks:** Implementing strategies to mitigate or eliminate risks.
- **Regulatory approvals:** Obtaining necessary approvals from government agencies for new drugs, medical devices, and other healthcare products.
- **Risk-mitigation strategies:** Design modifications, material modifications, risk-mitigation.

Note: This is an indicative list of course topics and is subject to change as per IIT Delhi's discretion.



Capstone Project

- Capstone project involves literature survey and/or analysis and/or synthesis on a topic related to Healthcare or an application of technology for Healthcare including but not limited to robotics, cobotics, augmented reality, biomechanics, medical devices and physiology. Capstone project will involve about 4 to 5 students working towards a common topic.



Exposure to the Latest Manufacturing and Testing Facilities



Additive Manufacturing

Biofabrication Facility



Prototyping & Polymeric Additive Manufacturing



Machining

EDMs

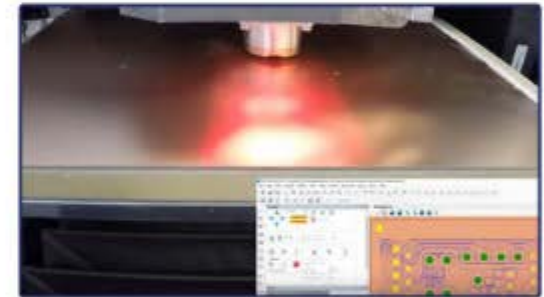


CNCs



PCB Manufacturing

Electronic Circuit and PCB Fabrication



3D Circuit Printer



For more details, visit- <https://www.mpragati.in/facilities>



Dive deeper into the details by visiting:
<https://www.ihfc.co.in/medical-robotics-centre/>.

Programme Details

Duration	<ul style="list-style-type: none">• 6 Months
Delivery	<ul style="list-style-type: none">• Live Online Sessions delivered through Direct-to-Device (D2D)
Schedule	<ul style="list-style-type: none">• Session Timings: Saturday, 11:00 am to 1:00 pm/ Alternative Timings: 4:00 pm to 6:00 pm• Application Closure Date: 25th June 2024• Commencement Date: 29th June 2024
Eligibility Criteria	<ul style="list-style-type: none">• Bachelor's degree in Science or Engineering or Medical fields (MBBS/Pharmacy / Nursing/ BDS or equivalent degree) with atleast 50% marks in total or 5.0 CGPA.
Screening & Selection	<ul style="list-style-type: none">• Screening and selection will be done by IIT Delhi
Admission Criteria	<ul style="list-style-type: none">• Selections will be based on a detailed Profile of the Candidate in his own words elaborating on his Academic record, Profile, Designation, Salary, Roles, Responsibilities, Job Description, and a write-up on "Expectations from the Programme"
Assessment	<ul style="list-style-type: none">• Assignments• Live Online• Projects• Term Papers
Attendance	<ul style="list-style-type: none">• Minimum 50% of attendance is mandatory.



Programme Fee Details

Fee Structure

Total Programme Fee

INR 1,30,000/- + GST

Instalment Pattern

Instalment 1:

INR 80,000/- + GST

(3 days from the release of offer letter)

Instalment 2:

INR 50,000/- + GST

(6th August 2024)

Easy EMI Options Available*

- Payment of fees should be submitted in the IIT Delhi CEP account only and the receipt will be issued by the IIT Delhi CEP account for your records.
- Loan Options is a service offered by Jaro Education. IIT Delhi is not responsible for the same.

Withdrawal & Refund from Programme:

- Candidates can withdraw within 15 days from the programme start date. A total of 80% of the total fee received will be refunded. However, the applicable tax amount paid will not be refunded on the paid amount.
- Candidates withdrawing after 15 days from the start of the programme session will not be eligible for any refund.
- If you wish to withdraw from the programme, you must email cepaccounts@admin.iitd.ac.in and crm.supportiitd@jaro.in, stating your intent to withdraw. The refund, if applicable, will be processed within 30 working days from the date of receiving the withdrawal request.

Programme Certification

- You will be awarded a **'Certificate of Successful Completion'**, if you obtain 70% aggregate marks in the evaluation components and maintain a minimum attendance of 50% in lectures.
- Participants who are unable to score 70% marks in the evaluation will be eligible for the **'Participation Certificate'** if they maintain a minimum attendance of 50% in lectures.



The image shows a sample certificate from the Indian Institute of Technology Delhi. At the top left is the IIT Delhi logo. To its right is the Indian national flag and the text "Indian Institute of Technology Delhi" with "KHAJURAHO, NEW DELHI - 110016" below it. Further right is a "Programme Code:" field with a flag icon. Below this is a line for "Department/Centre/School of _____". The main title is "Continuing Education Programme On Title of the Programme". Below that, it says "This is to certify that" followed by "Mr./Ms. Name Of The Participant". The text continues: "has successfully completed the online certificate programme on 'Title of the Programme' held from _____ to _____ by the Indian Institute of Technology Delhi." At the bottom, there are three signature lines: "Prof. Programme Coordinator", "Prof. Head of the Department", and "Prof. Head/Associate Head, QIP/CEP". A QR code is located at the bottom center. At the very bottom left, it says "An initiative under eVidya@IITD (e-Programs)".



The image shows a sample participation certificate from the Indian Institute of Technology Delhi. It has the same header as the first certificate, including the IIT Delhi logo, name, address, and programme code. Below the header, it says "Department/Centre/School of _____". The main title is "Continuing Education Programme On Title of the Programme". Below that, it says "This is to certify that" followed by "Mr./Ms. Name Of The Participant". The text continues: "has successfully completed the online certificate programme on 'Title of the Programme' held from _____ to _____ by the Indian Institute of Technology Delhi." At the bottom, there are three signature lines: "Prof. Programme Coordinator", "Prof. Head of the Department", and "Prof. Head/Associate Head, QIP/CEP". A QR code is located at the bottom center. At the very bottom left, it says "An initiative under eVidya@IITD (e-Programs)".

- The above e-certificate is for illustrative purposes only and the format of the certificate may be changed at the discretion of IIT Delhi.
- Only e-certificate will be provided and it will be issued by CEP, IIT Delhi.
- This programme is offered by the Centre for Biomedical Engineering (CBME).





Prof. Dinesh Kalyanasundaram

Ph.D., Iowa State University, USA

Prof. Dinesh Kalyanasundaram is a mechanical engineer by education (Bachelors: College of Engineering, Guindy; Masters: IIT Delhi; Ph.D.: Iowa State University; Post-doctoral research: University of Washington, Seattle; Biomedical consultant: L&T). His areas of interest include MedTech product design and manufacturing. Prof. Kalyanasundaram is the principal investigator of mPRAGATI, an ICMR-funded National facility for medical device translation.

His research group is focused on designing medical devices, validating their performance clinically and developing associated manufacturing processes. It develops both diagnostic devices as well as implantable devices. The group also works on tissue biomechanics and developing musculoskeletal models. The major research in the group includes developing devices for manufacturing processes for MedTech products.

In biomedical engineering, Prof. Kalyanasundaram works on both implantable as well as non-implantable medical devices like orthopaedic implants (Hip Replacement System, Knee Replacement System, Shoulder Replacement System, Spinal implants, Ocular implants, etc.), vascular implants (catheters, cardiovascular stents, neurovascular stents, tubing, etc.), a Hearing screening device, LAMP assay for pathogen diagnosis, Cervical cancer diagnosis, etc. These products have been developed in association with various institutes of immense prestige like All India Institute of Medical Sciences (AIIMS) Delhi, CSIR-CSIO Chandigarh, KGMU (King George Medical University) Lucknow, MAMC (Maulana Azad Medical College) Delhi, etc.



Prof. K K Deepak

MD & Ph.D., All India Institute of Medical Sciences, New Delhi

Prof. K. K. Deepak (MBBS, MD, Ph.D., DSc) is currently a Visiting Professor at CBME, IITD. He is former Head of the Department of Physiology, Dean (Exams), Chief of Centre for Medical Education and Technology at AIIMS, New Delhi. He has collaborations with BARC Mumbai, NIT Jalandhar, IIT Madras and ESIC Medical College Faridabad. Earlier he worked with IIT Roorkee and AB-IIIT Gwalior.

He set up the first Autonomic Function Lab in India in 1989 for clinical services, research, education and technological developments at AIIMS-ND. This has a human database of 23000. He supervised more than 125 theses. He has been instrumental in establishing the autonomic function labs in several medical institutions in the country. His team developed cloud-based analysis of Heart Rate Variability (cHRV) with Digital India Corporation. In 2000, he established India's first Vascular function lab in the Department of Physiology at AIIMS-ND which is contributing in R & D. Recently in 2023, he established first formal Biofeedback Clinic at AIIMS-ND.

He started Space Physiology lab at AIIMS in 2013 and continues to do R & D in this area. He filed a patent for a gravitational loading body gear "pro-gravity body gear" in 2016, which was published in 2018. This pro-gravity body gear was successfully utilized in earth-based experiments on microgravity. Prof. Deepak is also inventor in six more patents related to isometric exercise, human muscular fatigue recording, endurance meter for rodents, and other space physiology-related innovations. At the beginning of his career, he developed a physical blood pressure simulation model which was used in NASA experiments. He is formally trained in Educational Technology at Dundee Institute of Technology, Scotland in 1989. He served as a Visiting Professor at UCSD USA during 2017-2019.

He has published over 225 peer reviewed research papers (4500+ citations) with H index of 36. He has received several awards including highest awards of Physiology Associations (APPI & PSI) and NAMS fellowship in 2015.

Know The Facilitators



Prof. Priya Vashisth

Ph.D., IIT Roorkee

Dr. Priya Vashisth joined the Centre for Biomedical Engineering at IIT Delhi as an Assistant Professor in 2023. Her research focus includes the development of biomedical implants and localized drug delivery systems to treat complex coronary vascular diseases. Dr. Vashisth is also enthusiastic about creating tissue-based Exvivo platforms to understand vascular pathophysiology and evaluate the effect of various therapies and interventions. Such systems can reduce the dependency on animal models.

She obtained a Ph.D. degree in Biotechnology from IIT Roorkee in 2016, where she developed microbial polysaccharides-based dermal grafts using an electrospinning technique. She was a postdoctoral research associate at King's College London where she explored nano-needles-based platforms for localized drug and gene therapies. She also has served IIT Delhi as a DST-Inspire Faculty and developed bioresorbable and biostable drug-eluting vascular stents to treat atherosclerosis.





Prof. Deepak Joshi

Ph.D., Indian Institute of Technology Delhi (IITD)

Dr. Joshi received his Ph.D. in Biomedical Engineering from Indian Institute of Technology (IIT) Delhi and a postdoctoral from University of Oregon, USA in Human Physiology. He also worked at National University of Singapore, Singapore and Newcastle University, UK before joining IIT Delhi as a faculty. He has a technology transfer and a granted US patent to his credit. He is a passionate teacher and has received Teaching Excellence Award at IIT Delhi in the year 2017. He was also awarded the membership of American Association of Advancement in Sciences in the year 2014. Dr. Joshi's current research work combines experimental and computational techniques to understand the neural correlates during walking and balancing for the diagnosis of neuromuscular disorders and for the development of assistive devices for stroke survivors, amputees, elderly population, and Parkinson's patients. His research laboratory is primarily funded by Department of Science and Technology, Indian Council of Medical Research, Government of India.



Know The Facilitators



Prof. Pradeeba Sridhar

Ph.D. in Media Image Analsis, IIT Madras

Prof. Pradeeba Sridar received her Ph.D. degree in the area of medical image analysis from the Department of Engineering Design, IIT Madras. She was a joint cotutelle student with the School of Computer Science, The University of Sydney and spent approximately half of her candidature at both institutes. She was a recipient of the prestigious Endeavour Research Fellowship, in 2014. After her Ph.D., she was a visiting academic at the University of Sydney, where she deployed an automated framework leveraging the state-of-the-art machine learning (ML) and image processing techniques to identify specific images from the hospital repository and extract relevant clinical information. She is currently an Honorary Associate with the Sydney Medical School Nepean. She worked as a senior project Scientist at IITM in 2021. Her research involves the design and development of novel algorithms using state-of-the-art ML techniques, design and deployment of working models in the clinical settings. It includes the collection of relevant knowledge and implementation of an efficient computing framework at the hospital, adherence to ethics and clinical standards.

Her research interests include the development of an automated framework for fetal ultrasound image analysis, retinal image analysis, translational engineering, signal processing and machine learning for medical image analysis. Dr. Pradeeba served as an Assistant Professor at IIT Delhi before joining the Department of Medical Sciences and Technology, IITM.



Know The Facilitators

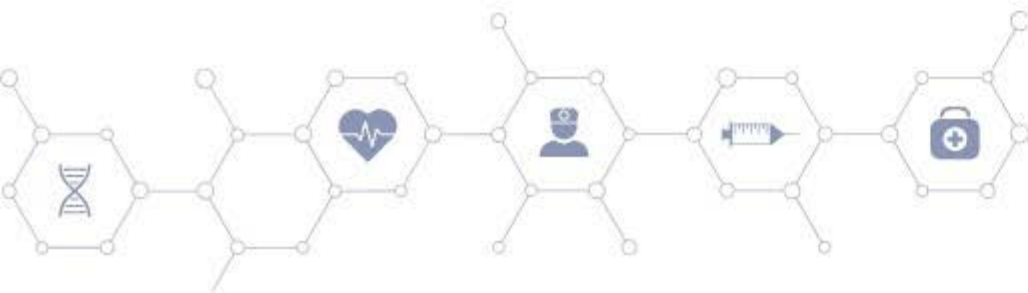


Prof. S K Saha

Ph.D., Dynamics of Robotic Systems, McGill University, Canada
M.Tech, Machine Tool Engineering, IIT Kharagpur, India

Prof. Subir Kumar Saha, a 1983 Mechanical Engineering graduate from RE College (Now NIT), Durgapur, India, completed his M. Tech from IIT Kharagpur, India, and Ph.D. from McGill University, Canada. Upon completion of his Ph.D., he joined Toshiba Corporation's R&D Center in Japan. After 4-years of work experience in Japan, he has been with IIT Delhi since 1996.

He is actively engaged in teaching, research, and technology transfer. He completed sponsored projects and consultancies worth about Rs. 14 crores (USD 2.0 millions). Prof. Saha was awarded the Distinguished Alumnus Award for 2020 in Academic and Research by NIT Durgapur. He established the Mechatronics Laboratory at IIT Delhi in 2001, and contributed significantly in the development of the Programme for Autonomous Robotics during 2010-16 with the funding from BARC/BRNS, Mumbai. As a recognition of his international contributions, Prof. Saha was awarded the Humboldt Fellowship in 1999 by the AvH Foundation, Germany. He was Naren Gupta Chair Professor at IIT Delhi during 2010-20, and presently acting as the Project Director of IHFC (a non-profit company of IIT Delhi in the area of Cobotics). He has been also visiting faculty at IIT Madras, and short-term researcher at McGill University, Canada, Monash University, Australia, and University of Verona, Italy.



ABOUT IIT DELHI



as per QS World University
Ranking (2024) in India



as per NIRF India
Engineering Rankings (2023)

The Indian Institute of Technology Delhi (IIT Delhi) is one of the 5 initial IITs established for training, research and development in science, engineering and technology in India. Established as College of Engineering in 1961, the Institute was later declared as an Institution of National Importance under the "Institutes of Technology (Amendment) Act, 1963" and was renamed as "Indian Institute of Technology Delhi". It was then accorded the status of a Deemed University with powers to decide its own academic policy, to conduct its own examinations, and to award its own degrees.

Since its inception, over 48000 students have graduated from IIT Delhi in various disciplines, including Engineering, Physical Sciences, Management, Humanities and Social Sciences. Of these, nearly 5070 received Ph.D. degrees. The rest obtained a Master's Degree in Engineering, Sciences and Business Administration. These alumni today work as scientists, technologists, business managers and entrepreneurs. There are several alumni who have moved away from their original disciplines and have taken to administrative services, active politics, or are with NGOs. In doing so, they have significantly contributed to the building of this nation and to industrialization around the world.



About Continuing Education Programme (CEP)

Executive education is a vital need for companies to build a culture that promotes newer technologies and solutions and builds a workforce that stays abreast of the rapidly transforming needs to the technological, business and regulatory landscape. Committed to the cause of making quality education accessible to all, IIT Delhi has launched Online Certificate Programmes under eVIDYA@IITD (ई-विद्या@IITD): enabling Virtual & Interactive-learning for Driving Youth Advancement@IITD for Indian as well as international participants. These outreach programmes offered by the Indian Institute of Technology Delhi (IIT Delhi) are designed to cater to the training and development needs of various organisations, industries, society and individual participants at national and international level with a vision to empower thousands of young learners by imparting high-quality Online Certificate Programmes in cutting-edge areas for their career advancement in different domains of engineering, technology, science, humanities and management.



Services Provided by:

jaro education

Tith, Vani Apartment Vikas Centre, CG Rd, near Basant Theatre, Wadavli,
Vasant Vihar Complex, Chembur, Mumbai, Maharashtra 400074

Jaro Programme Expert

Ms. Priya Rathod
9766490273
priya.rathod@jaro.in

For any feedback, please write to CEP, IIT Delhi at
contactcep@admin.iitd.ac.in

Online Certificate Programmes are offered by the Indian Institute of Technology Delhi under the aegis of Continuing Education Programme (CEP) so that the Institute can realise its vision of serving as a valuable resource for industry and society, and fulfil its mission to develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in a range of professions.