



भारतीय प्रौद्योगिकी संस्थान दिल्ली
Indian Institute of Technology Delhi



Executive Programme in Robotics

05 Months | 15th June, 2024 | Live Online Lectures

The Rise of Robotics

In the dynamic realm of robotics, where innovation is key, recent statistics underscore the transformative impact of this cutting-edge technology. The surge in interest and investment in robotics is evident, with numbers telling a compelling story of advancements and widespread adoption.

Global robotics spending soared 22%, hitting \$150 billion amid multifaceted benefits.

Statzon.com

One of the most notable trends is the remarkable surge of Cobots by 40%, which are designed to work alongside human operators, signalling a shift to human-centric automation prioritising safety and collaboration in diverse sectors.

In terms of industry applications, healthcare stands out as a frontrunner in adopting robotic technologies. Surgical robots, in particular, have seen a 30% increase in utilisation, facilitating minimally invasive procedures and enhancing precision in medical interventions.

Manufacturing continues to be a robust domain for robotics, with a 25% rise in the implementation of industrial robots. These machines play a pivotal role in tasks, ranging from assembly and welding to quality control, contributing to increased productivity and consistent product quality.

The global robotics workforce has expanded by 18%, highlighting the growing demand for skilled professionals in this field. Educational institutions and training programmes have responded to this need, with a 20% increase in enrolment in robotics-related courses and certifications.

Amidst this surge, it's crucial to note the diverse applications of robotics. From the agricultural sector, where drone usage has increased by 35% for crop monitoring, to the logistics industry, which is witnessing a 28% rise in the adoption of autonomous delivery robots, robotics is permeating various facets of our daily lives.

*An **Executive Programme in Robotics** strategically propels professionals to the forefront of innovation and leadership. It helps them gain a comprehensive understanding of robotics and its transformative impact on industries. In an era shaped by automation and artificial intelligence, it equips executives to navigate this dynamic terrain, offering a unique blend of managerial insights and technical expertise, positioning themselves as leaders in the rapidly evolving realm of technology-driven business.*

Executive Programme in Robotics

In the current era of technological transformation, Robotics has emerged as a pivotal force shaping global industries. Rapid advancements in technologies such as rapid prototyping, cloud computing, the Internet of Things, and Artificial Intelligence have propelled the widespread integration of robots across various sectors, including healthcare, automotive, and space exploration. This surge in robotic applications demands an immediate focus on upskilling and reskilling individuals involved in the conception, design, development, manufacturing, and operation of robots.

IIT Delhi's Executive Programme in Robotics is designed to meet this demand by providing comprehensive training from fundamental principles to the execution of advanced applications. It is a unique opportunity for individuals seeking expertise in navigating and contributing to the evolving landscape of robotics for enhanced human well-being and productivity.

Programme Highlights



A programme from the Centre for Biomedical Engineering, IIT Delhi. IIT Delhi is ranked #2 as per QS World University Rankings 2023 in India in the engineering and technology category.



Five months of immersive online lectures



Sessions by IIT Delhi faculty and industry experts



E-certificate issued by CEP, IIT Delhi



120 Hours of Live online learning

Who Should Attend?

- Graduates willing to get into the field of Robotics.
- Engineers, Researcher, or Entrepreneur interested in upskilling or reskilling to develop and manage new robotic technologies.
- Professionals in companies willing to use robotics and AI/ML to leverage product development and manufacturing.
- Multidisciplinary product designers, developers and managers (e.g., hospitals interested in surgical robots).
- Entrepreneurs interested in robotics, AI, and automation.

Job Roles

Below are the job roles available in this field:

Robotics Engineer

Designs, builds, and maintains robots and robotic systems, integrating principles of mechanical, electrical, and computer engineering to create efficient and functional machines.

Mechatronics Engineer

Combines expertise in mechanical engineering, electronics, and computer control to design and develop advanced automated systems, including robotics, with a focus on optimizing performance and functionality.

Robot Operator

Operates and monitors robotic systems, ensuring smooth functionality, troubleshooting issues, and performing routine maintenance tasks to maximize efficiency and productivity.

Robotics Programmer

Writes code and algorithms to enable robots and automated systems to perform specific tasks, programming their movements, actions, and responses.

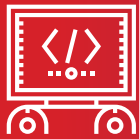
Robotics Account Manager

Manages client relationships and oversees the implementation of robotics solutions, providing technical expertise, coordinating project timelines, and ensuring customer satisfaction with robotic products and services.

Learning Outcomes



Construct robotic devices mechanically and electronically from scratch.



Develop and implement robotic programmes using programming languages commonly used in the robotics industry.



Effectively operate a variety of sensors and actuators, understanding their significance in robotics.



Utilise the Robotics Operating System (ROS) to design, control, and coordinate robotic systems and networks.



Understand the principles of robotic vision and how to apply visual sensors in robotics applications.

Programme Curriculum

Module 1: Fundamentals of Robotics and Automation

1. Introduction to robotics in industry and society, historical perspectives
2. Classification of robots and overview of current research in robotics, applications of AI/ML
3. Robotics market, current challenges, and opportunities
4. System-level architecture of robots – Levels of autonomy
5. Fundamental concepts of robots – Components, joints, coordinate systems, workspace
6. Kinematics and kinetics of robots
7. Dynamics of a robot – Trajectory and path

Learning Outcomes:

1. Learn about the state-of-the-art of robotics and the opportunities
2. Understand the principles of design and functioning of robot

Module 2: Sensing and Perception

1. Role of interoceptive and exteroceptive sensing
2. Position, velocity, and acceleration sensors
3. Force and torque sensing
4. Robotic tactile sensors and soft haptics
5. Non-contact sensing using ultrasonic, LIDAR, and RADAR
6. Camera-based robotic sensing and machine vision
7. Computational models and methods for processing sensor information

Learning Outcomes:

1. Learn about the fundamentals of robotic sensing in-depth
2. Understand implementation strategies for robotic sensing

Programme Curriculum

Module 3: Actuators and Motion

1. Role and characteristics of robotic actuators
2. Electrical motors – Servos, stepper motors and drive mechanisms
3. Pneumatic and hydraulic actuators
4. Soft robotic actuators
5. Electroactive polymers, shape memory actuators, and emerging paradigms
6. Biomimetic actuators, artificial muscle technology and wearable actuators
7. Role of 3D printing and mechanical testing in robotic fabrication

Learning Outcomes:

1. Learn how to make a robot move and perform key tasks
2. Understand mechanical and electrical aspects of robotics

Module 4: Modelling, AI, and Machine Learning

1. Localisation, navigation, and environment representation
2. Designing of robotic components using CAD
3. Introduction to Robot Operating System (ROS)
4. 3D robot modelling, motion planning, and simulation in ROS
5. Interfacing hardware and sensors to ROS
6. Introduction to the role of machine learning in robotics – Software architecture, behavior-based systems
7. Neural networks and genetic algorithms in robotics
8. Introduction to Deep Learning and applications in robotics

Learning Outcomes:

1. Learn how to design and strategize movement of a robot
2. Learn applications of AI and Machine Learning in robotics

Programme Curriculum

Module 5: Embedded Control and Mechatronics

1. Introduction to embedded computing and control
2. Introduction to embedded hardware platforms – Arduino and Raspberry Pi
3. Programming and interfacing of sensors and actuators
4. Wired and wireless communication systems – MODBUS, CAN, and other paradigms
5. Multi-tasking and closed-loop control of robots

Learning Outcomes:

1. Learn software development for robotic control
2. Learn about key sensing and interfacing techniques for robotic functionalisation

Module 6: Applications and Future Directions

1. Introduction to biorobotics and bionics – Exoskeleton device, prosthetics and surgical robotics
2. Humanoid robots – Future directions in automation
3. Human-Robot Interaction (HRI) and Collaboration – Collaborative robotics
4. Manufacturing automation using industrial robots – The next industrial revolution
5. Safety standards in industrial robotics
6. Roboethics: Navigating the ethical use and pitfalls of robotics and AI

Learning Outcomes:

1. Learn about a range of robotic applications in research and industry
2. Understand about standards and ethics associated with robotics and AI

Programme Curriculum

Tutorials

- Designing on CAD
- 3D Printing
- Arduino Programming
- AI/ML in Robotics
- DIY Robotics

Tools

- CAD Designing Software
- 3D Printers
- Arduino
- DIY Robotics Kits

Hands-on Project

Development of one robot per participant, with detailed research, specifications, design, and prototype. A development kit can be purchased as a part of the programme. Learners will bear the cost of the development Kit.

Programme Details



Pedagogy

The programme will be offered through a unique blend of diverse pedagogical tools such as lectures, tutorials, hands-on tools, and projects.

- Theory: 40%
- Practical: 60%



Programme delivery

Live Online Sessions delivered
Direct to Device (D2D)



Duration

- 5 Months
- 120 hours of Live Online Learning
 - ▶ Live Online Session - 80 Hours
 - ▶ Project: 40 Hours



Class Schedule

Every Saturday and alternate
Sundays: 10:00 AM to 2:30
PM with a break in between.



Eligibility Criteria

Bachelor's degree in any
discipline with minimum of
55% marks



Admission Criteria

Selection based on application review



Assessment & Evaluation

- 40% - Assignments
- 50% - Project
- 10% - Attendance



Certification*

- Candidates who score at least 50% marks overall and have a minimum attendance of 50%, will receive a 'Certificate of Completion'.
- Candidates who score less than 50% marks overall and have a minimum attendance of 50%, will receive a 'Certificate of Participation'.
- The organising department for this programme is the Centre for Biomedical Engineering, IIT Delhi.



**Only e-Certificates will be issued by CEP, IIT Delhi for this programme.*

Programme Coordinators



DR. BISWARUP MUKHERJEE

Assistant Professor

Center for Biomedical Engineering,
Indian Institute of Technology Delhi

Dr. Biswarup Mukherjee is an Assistant Professor at the Center for Biomedical Engineering, IIT Delhi. His research effort is focused towards developing multi-modal platform technologies that provide the means to non-invasively monitor aspects of neuromuscular activity in real-time, particularly for rehabilitation applications. Development of biomimetic sensors to improve sensorimotor integration in individuals with motor disabilities. He is also interested in developing tools and devices for quantitative assessment of motor skills.

He obtained a PhD in Electrical Engineering from IIT Madras, where he developed capacitive and magnetic sensing systems for medical training and simulation applications. He was a postdoctoral research fellow at Harvard Medical School, where he developed novel medical training models for emergency medicine, ophthalmology, and nursing. He was a Research Assistant Professor with the Department of Bioengineering at George Mason University. He was also an affiliate faculty at the Center for Adaptive Systems of Brain-Body Interactions at Mason. There, he was involved in multiple federally funded projects to develop low-power ultrasound instrumentation and techniques for muscle-activity monitoring for prosthetic and rehabilitation applications.

Programme Coordinators



DR. ARNAB CHANDA

Assistant Professor

Center for Biomedical Engineering,
Indian Institute of Technology Delhi

Dr. Arnab Chanda is an Assistant Professor in the Centre for Biomedical Engineering, IIT Delhi, and a joint faculty at the Department of Biomedical Engineering, AIIMS, Delhi. He is also the founder of a start-up company BIOFIT Technologies LLC, USA. He obtained his PhD from the University of Alabama, USA and has also been a Postdoctoral Researcher at the University of Pittsburgh, USA. Dr. Chanda is an expert in biomechanics, robotics, and wearable device development. From an upper-limb exoskeleton device development for rehabilitation of patients with spinal cord injury, to rapid manufacturing of ultra low-cost pressure measurement insoles for diabetic patients, Dr. Chanda has been extensively involved in conception-to-delivery of robotic devices. Recently, his lab developed the first portable robotic slip testing device in the world which can measure the frictional performance of any footwear-flooring combination and prevent the incidences of slips and falls. His research has received a lot of media attention and have been published by The Times of India, NDTV, and The Indian Express.

Dr. Chanda is a recipient of the Early Career Faculty Research Award, and Young Researcher awards from ASME and MHRD and AO Spine International-Singapore. He has 10+ US and Indian Patent applications and has authored 4 Books and 100+ articles in reputed international journals. Dr. Chanda is in the list of top 2% scientists worldwide as per Scopus Elsevier 2023 database. He is also serving as the editor for a book series published by Springer Nature, editorial board member for Nature Scientific Reports, coordinator of the “Executive Programme in Healthcare Entrepreneurship and Management”, and guest editor for several journals such as Frontiers in Bioengineering and Biotechnology, and Engineering Research Express, IOP Publishing.

Programme Fee

| Particulars | Amount (₹) |
|-------------------|-----------------|
| Programme Fee | 1,50,000 |
| GST @18% | 27,000 |
| Total Fees | 1,77,000 |

Note:

- All fees should be submitted in the IITD CEP Account only, and the details will be shared post-selection.
- The receipt will be issued by the IIT Delhi CEP account for your records.
- Easy EMI options available.
- Loan and EMI Options are services offered by TimesPro. 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 icare@timespro.com stating your intent to withdraw. The refund, if applicable, will be processed within 30 working days from the date of receiving the withdrawal request.

Instalment Schedule

| Instalment | Instalment Date | Amount (₹)** |
|-------------------|---------------------------------------|--------------|
| Registration Fee* | To be paid at the time of application | 10,000 |
| I | Within one-week of offer rollout | 50,000 |
| II | 10 th August, 2024 | 45,000 |
| III | 10 th September, 2024 | 45,000 |

Note:

- *Registration fee of ₹10,000 will be charged for processing the selected applications only, post confirmation email from the institute. The registration fee is also part of the total programme fee.
- An offer letter from CEP, IIT Delhi will be released post the successful receipt of the Registration Fee.
- **GST@ 18% will be charged extra in addition to the fee.

Programme Timelines

| | |
|--------------------------|----------------------------------|
| Application Closure Date | Refer to Website |
| Programme Start Date | 15 th June, 2024 |
| Programme End Date | 23 rd November, 2024 |

APPLY NOW 



भारतीय प्रौद्योगिकी संस्थान दिल्ली Indian Institute of Technology Delhi



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 the College of Engineering in 1961, the Institute was later declared 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, conduct its own examinations, and award its own degrees. Since its inception, over 48,000 students have graduated from IIT Delhi in various disciplines including Engineering, Physical Sciences, Management, and Humanities & Social Sciences.

For more details, please visit: www.iitd.ac.in

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 in 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 and 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 levels 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.

For more details, please visit: <http://cepqip.iitd.ac.in>

2nd
in NIRF Ranking 2023
(Engineering)

2nd
in Outlook ICARE Rankings
2023 (Engineering)

2nd
in QS at World University
Rankings 2024 in India

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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.