



Indian Institute of Science
भारतीय विज्ञान संस्थान

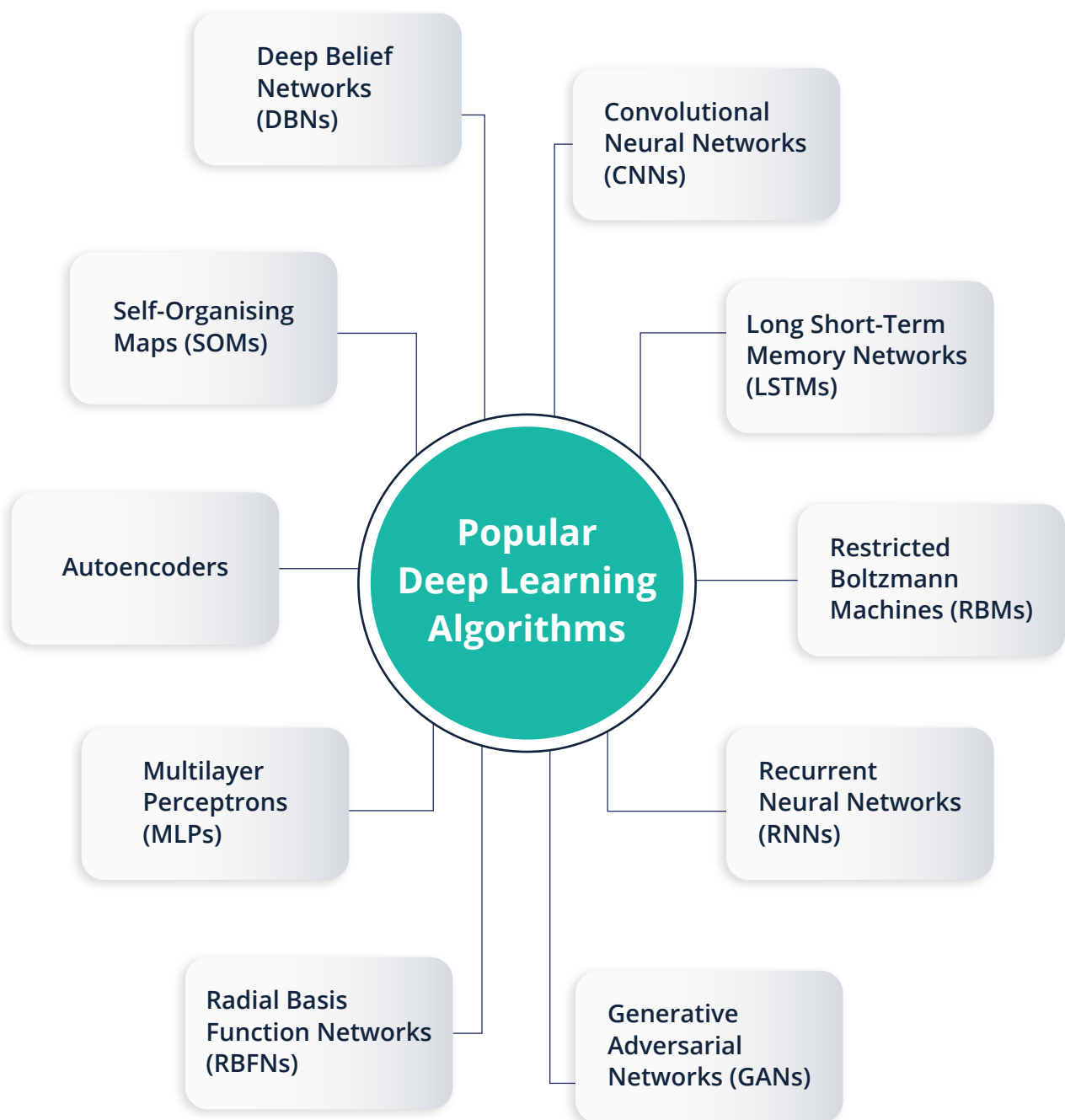


Certificate Programme in Applied AI: Advanced Deep Learning Techniques by IISc Bangalore

8 Months | Starts 30th March, 2025 | Live Online Lectures

Elevating AI: The Evolution of Advanced Deep Learning

Deep Learning, a subset of Machine Learning, involves algorithms designed to analyse data in a way that mimics human thought processes. Utilising a layered structure of algorithms known as Artificial Neural Networks (ANNs), which are inspired by the human brain's biological neural networks, Deep Learning can handle complex data patterns. This architecture allows Deep Learning models to achieve performance levels that often surpass those of traditional Machine Learning models, both in supervised and unsupervised learning scenarios.



Programme Overview

Deep Learning, a subset of Machine Learning, utilises deep neural networks to perform complex decision-making and predict outcomes from large datasets. This technology drives innovations in areas like image recognition, natural language processing, and financial forecasting. **Certificate Programme in Applied AI: Advanced Deep Learning Techniques by IISc Bangalore** will first establish a robust understanding of deep learning principles and practical applications.

In addition, the programme delves into Reinforcement Learning, a method for dynamic decision-making under uncertainty using data-driven optimisation. Reinforcement Learning, applicable in fields such as robotics and adaptive control, often involves model-free algorithms and deep neural networks. The course will provide comprehensive training in these techniques and explore cutting-edge algorithms in Deep Reinforcement Learning. Enrol and gain expertise in these transformative technologies.

Programme Highlights



8-month online programme



Advanced certification from IISc Bangalore



Unparalleled learning experience from IISc faculty



Industry-relevant DL tools like Pytorch, etc.



Hands-on experience through practical projects and a capstone project



One-day campus immersion (optional)



Maximise your learning with live tutorials

Who Should Attend

- Graduates from science or engineering background seeking a career in the ML/DL Domain
- Professionals in the software and IT industry, research scholars, and tech enthusiasts seeking to upskill in ML/DL expertise

Learning Outcomes

- Rigorous foundation in Deep Learning as well as Deep Reinforcement Learning through the various tools, techniques and algorithms in Deep Learning and Deep Reinforcement Learning
- Adequate knowledge of the state-of-the-art algorithms and techniques
- Possess knowledge of how and where to apply which algorithms in practice

Programme Curriculum

Module 1: Introduction and Basics

- Introduction to Deep Learning
- Introduction to Deep Reinforcement Learning
- Basics of Probability
- Basics of Linear Algebra
- Basics of Optimisation

Learning Outcomes

Get a good overview and introduction to deep learning and deep reinforcement learning. You will also get strong foundations in probability, linear algebra and optimisation tools that will be useful for the development and analysis of algorithms in this domain.

Module 2: Linear Models for Regression and Classification

- Linear models
- Least squares method
- Logistic regression
- Generative and discriminative models
- Linear regression as Maximum likelihood estimation
- The Bayesian view
- Bias-Variance decomposition
- Maximum likelihood with latent variables – EM algorithm
- K-means Clustering, PCA

Learning Outcomes

You will get a strong foundation in machine learning by understanding the important topics that will be useful in the subsequent modules as well.

Module 3: Foundations of Neural Networks

- Nonlinear models for classification and regression
- Multilayer perceptrons
- Gradient descent on squared error loss, Backpropagation (BP), automatic differentiation
- Stochastic gradient descent and the mini-batch algorithm
- Optimization issues – BP with momentum, weight decay, ADAM algorithm, dropout
- Cross-entropy loss
- Issues of Generalization

Learning Outcomes

The student will get the basic foundations of neural network models for classification and regression after this module. The backpropagation procedure will be covered in detail and issues relevant to learning algorithms would be discussed.

Module 4: Deep Learning and Models

- Overview of Convolutional Neural Networks (CNNs)
- CNNs in computer vision and some standard models (e.g., VGG net, Resnet)
- Simple Overview of recurrent neural networks (GRU and LSTM)
- Simple overview of Encoder-Decoder architectures, Transformers, Attention models
- Deep Generative models: Simple overview of RBM, VAE, GAN

Learning Outcomes

Acquire knowledge on important models for deep learning and will get a good practical view of these models.

Module 5: Foundations of Reinforcement Learning

- Multi-armed Bandits
- Markov Decision Processes (MDPs)
- Examples
- Numerical Solutions

Learning Outcomes

Formulate a real-world problem in the RL framework and apply model-based algorithms.

Module 6: Model-free Approaches under Full-state Information

- Monte-Carlo Algorithms for Prediction and Control
- On-policy and Off-policy Algorithms
- Temporal Difference Learning
- Q-learning/SARSA/Expected SARSA Algorithms
- Double Q-learning

Learning Outcomes

Get a good handle on basic RL algorithms that can be applied in moderate state-action spaces.

Module 7: Model-free Approaches with Parametric Optimisation

- Temporal Difference Learning with Function Approximation
- Linear and Non-linear Function Approximation Architectures
- Q-learning/SARSA/Double Q-Learning with Function Approximation
- Policy Gradient Methods
- REINFORCE Algorithm
- Actor-critic Algorithms

Learning Outcomes

Understand and apply various function approximation architectures and get a good understanding of which algorithms will work better in what settings.

Module 8: Deep Reinforcement Learning Algorithms

- Deep Value and Policy-based Algorithms
- The Deep Q-network Algorithm (DQN)
- Trust Region Policy Optimisation (TRPO)
- Proximal Policy Optimisation (PPO)
- Asynchronous Advantage Actor Critic (A3C)
- Generalised Advantage Estimation Algorithm (GAE)

Learning Outcomes

Get fully acquainted to almost all the recent Deep RL algorithms and will be able to apply these algorithms in real-world problem scenarios.

Assignments and Projects

Assignment 1	Implementing linear regression and classification
Assignment 2	Implementing MLP using backpropagation
Assignment 3	Image classification using CNNs and implementing different CNN models.
Assignment 4	Implementation of value/policy iteration algorithms on Grid World setting
Assignment 5	Studying implementations of Monte-Carlo and temporal difference algorithms on Grid World
Assignment 6	Use stable baselines and hugging face together. Using models as black box, fine tune these already available models and deploy over hugging face
Capstone Project	Implementation of Deep learning and Deep RL algorithms on various gym/Atari environments and studying detailed performance comparisons. Hyper-parameter tuning and algorithm tweaking for enhanced performance

Tools to be taught

Python	 python™
Pytorch	 PyTorch

Job roles for you

Below are the job roles available in this field:

Deep Learning Engineer: Focuses on designing, building, and Optimising deep learning models and architectures.

AI/ML Engineer: Works on implementing and integrating machine learning models into production environments, often involving deep learning models for tasks like image recognition, natural language processing, and recommendation systems.

NLP Engineer: Focuses on natural language processing tasks using deep learning models, including transformers (BERT, GPT) for text classification, language modeling, translation, and sentiment analysis.

Career Support



Personal Branding

- Introduction to networking platforms
- Profile creation on professional networking platforms like LinkedIn, Lunchclub, etc.
- LinkedIn Profile Review
- How to create personal brand presence on LinkedIn?
- How to increase post engagement on LinkedIn?
- Active networking



Business Communication

- Role and importance of effective communication as a leader
- The art of providing constructive feedback for successful team
- Importance of non-verbal communication
- Key elements of executive body language



Job Search Strategy

Resume Creation

- Importance of creating ATS friendly executive resume
- Executive resume sections and structure
- Tailoring resumes for different roles and industries
- Write a powerful resume that stands out from the competition
- Resume Review - Peer to peer review and Q&A



Interview Preparation

Pre-interview Etiquettes

- Learn about top-down approach for interviews
- Pre-interview tips and tricks

In-interview Etiquettes

- Create a self-elevator pitch
- Understanding interviewer mindset
- Interview grooming sessions and tips and tricks for interview

Post-interview Etiquettes

- Reflecting on interview experience and incorporating the feedback
- Relationship building with the recruiter
- Learn how to follow up on your job application

Access to Selected Job Opportunities Through:

- Curated job opportunities from top job boards, brought straight to your inbox through our Job Digest.
- Job openings from TimesPro hiring partners.

Note: Career support facility is offered by TimesPro. IISc Bangalore is not responsible for the same.

Programme Details



Eligibility Criteria

Graduate or Postgraduate in Engineering, Technology, Computer Science, Data Science, Mathematics, Statistics, Physics, Electronics or any related areas with strong and recent Mathematics background.



Programme Delivery

Live Online Sessions delivered Direct-to-Device (D2D)



Class Schedule

Saturday: 2:00 pm to 3:30 pm and
4:00 pm to 5:30 pm

Sunday: 10:00 am to 11:00 am



Admission Criteria

Selection based on application review



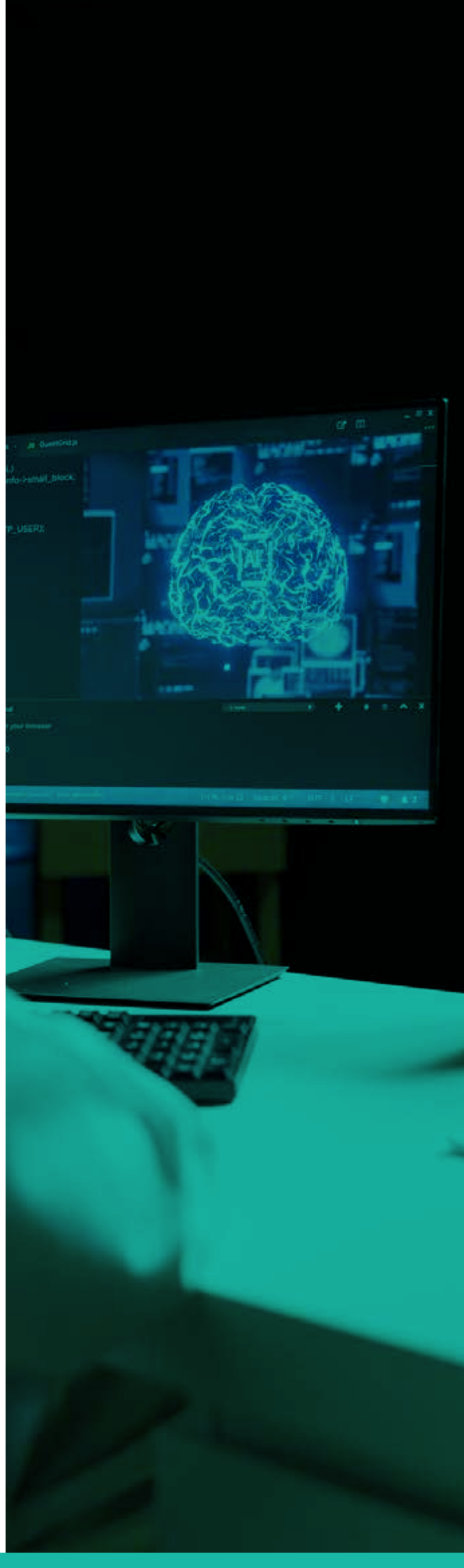
Duration

8 months



Learning Time: 244 hours

- 136 hours live sessions and tutorials / demo/programming
- 30 hours Capstone Project
- 72 hours Self-paced
- 6 hours Campus Immersion



Campus Immersion

There will be an optional 1-day campus immersion for interaction between faculty and learners.

Evaluation

Evaluation is based on – Exam, Assignments, and Project Completion

70% - End-of-programme MCQ-based exam

30% - assignments & project

Certification

Candidates who score at least 50% marks overall and have a minimum attendance of 75%, will receive a 'Certificate of Completion' from IISc Bangalore.

(The attendance part is as per institute norms)



**All certificate images are for illustrative purposes only and may be subject to change at the discretion of IISc Bangalore.*

Programme Experts



Dr. Shalabh Bhatnagar

Department of
Computer Science and
Automation,
Indian Institute of
Science Bangalore

Dr. Shalabh Bhatnagar received his Bachelor's in Physics Hons. from the University of Delhi in 1988, and his Master's and PhD from the Department of Electrical Engineering at the Indian Institute of Science in 1992 and 1997, respectively. He was a Postdoctoral Research Associate at the University of Maryland, College Park, USA, from 1997 to 2000 and at the Free University, Amsterdam, from 2000 to 2001. He was a Visiting Faculty at the Indian Institute of Technology, Delhi, from July to December 2001. Since December 2001, he has been at the Department of Computer Science and Automation, Indian Institute of Science, where he is a Senior Professor. Dr. Bhatnagar's research interests are in Reinforcement Learning, Data-Driven Optimisation and Stochastic Approximation Algorithms. He has authored or co-authored more than 220 papers in top international journals and conferences. He is an Associate Editor of the IEEE Control Systems Letters and the Systems and Control Letters journals and a Past Associate Editor of the IEEE Transactions on Automation Science and Engineering. He is a Fellow of the following prestigious academies: Asia-Pacific Artificial Intelligence Association, Hong Kong; the Indian National Science Academy; the Indian Academy of Sciences; the National Academy of Sciences, India; and the Indian National Academy of Engineering. He was a Senior Associate of the International Centre for Theoretical Physics, Trieste, Italy, and has received several national awards and honours, including the ACCSCDAC Foundation Award; the Prof. Satish Dhawan Young Engineer Award from the Government of Karnataka; the Rajib Goyal Young Scientist Award; the Rustom Choksi Award for Research Excellence in Engineering, and the Dr. Rajkumar Varshney Award for Lifetime Contributions to Systems Theory from the Systems Society of India. He is also a J. C. Bose National Fellow.



Dr. P.S. Sastry

Honorary Professor,
Indian Institute of
Science Bangalore

Dr. P.S. Sastry received his B.Sc(Hons.) in Physics from IIT, Kharagpur in 1978, BE in Electrical Communications Engineering and PhD in Electrical Engineering, both from IISc, Bangalore in 1981 and 1985 respectively. He has been a faculty member at IISc from 1986 and he retired as a Professor in 2024. Currently he is an Honorary Professor at IISc. He has held visiting positions at University of Massachusetts, Amherst, USA; University of Michigan, Ann Arbor, USA; General Motors Research Labs, Warren, USA; and Texas A&M University, College Station, USA. Dr. Sastry's research interests are in Learning Automata, Pattern Recognition, Machine Learning, Data Mining and Computational Neuroscience. He had been an associate Editor of IEEE Transactions on Systems, Man and Cybernetics, IEEE Transactions on Cybernetics, IEEE Transactions on Automation Science and Engineering, and a Senior Associate Editor of Sadhana. He received several awards including Sir C.V.Raman Award for young Scientists from Government of Karnataka, Hari Om Ashram Vikram Sarabhai Research Award from PRL, Ahmedabad, Most Valued Colleague Award from General Motors Corporation, USA, and The Alumni Award for Excellence in Research from IISc, Bangalore. He is a Fellow of Indian national Academy of Engineering and the National Academy of Sciences, India.

Programme Fees

Particulars	Amount (₹)
Registration Fee	10,000
Programme Fee	1,89,000
GST@18%	35,820
Total	2,34,820

0% Interest loan options available

- Learners are required to pay the fees within 14 days of receiving the offer letter.
- Learner paying full fees within 5 days of receiving offer letter will receive ₹15,000 discount on fees.
- Learner paying full fees within 10 days of receiving offer letter will receive ₹7,500 discount on fees.

Payment Schedule

Component	Date	Amount (₹)*
Instalment 1**	To be paid at acceptance to offer	10,000
Programme Fee	Before start of the programme (within 14 days of offer letter release)	1,89,000

- **GST@ 18% will be charged extra in addition to the fee.
- **Instalment 1 of INR 10,000/- (part of the total programme fee) is to be paid at the acceptance of offer to block the seat.
- The LMS access will be made active on successful receipt of the total programme fee.
- Instalment 1 is non-refundable.
- No refund is applicable after the start of the Programme.

0% Interest payment options are available

Loan Tenure	EMI Amount in (₹)*
12	18,445
18	12,656
24	9,804

Programme Timelines

Last Date to Apply	Refer To Website
Programme start date	30 th March, 2025
Programme end date	November 2025

APPLY NOW



The Esteem of IISc

The Indian Institute of Science (IISc), established in 1909, is a premier institution dedicated to research and higher education in science and engineering. Located in Bengaluru, it has been a pioneer in advancing scientific knowledge and has consistently ranked among the top universities globally. IISc is renowned for its cutting-edge research, interdisciplinary approach, and world-class faculty, making it a hub for innovation and excellence. The institute offers a range of undergraduate, postgraduate, and doctoral programmes, fostering a vibrant academic community committed to addressing global challenges through research and education. Over the years, IISc has developed an impressive ecosystem that supports high-impact research across various domains, from basic sciences to advanced engineering. Its collaborations with industry, government, and international institutions further enhance its contributions to science and society. The institute's state-of-the-art facilities and dynamic campus environment provide an ideal setting for students and researchers to explore new frontiers in knowledge and technology.

For more information, <https://www.iisc.ac.in/>



**Times Higher Education
University (2024)**



TimesPro, the award-winning EdTech initiative of The Times Of India Group, was established in 2013 to cater to the diverse learning needs of Indians with aspirations of career growth.

Taking the rich legacy of trust, knowledge, and learning of The Times Of India Group forward, TimesPro strives to embody the values of Education 4.0 – learner-centric, industry-relevant, role-specific, and technology-enabled – in its executive education programmes.

Ranging across industries and domains, these programmes are curated and offered in collaboration with premier national and global educational institutions to fulfil the aspirations of millions of professionals by equipping them with the right knowledge and skills.

Programme Partner



1801 & 1802, F Wing, Bennett Coleman & Co. Ltd.,
Lotus Corporate Park, Off Western Express Highway,
Geetanjali Railway Colony, Laxmi Nagar, Jogeshwari East,
Mumbai, Maharashtra - 400063 India

Contact Number: 1800-120-2020
admissions@timespro.com | www.timespro.com

