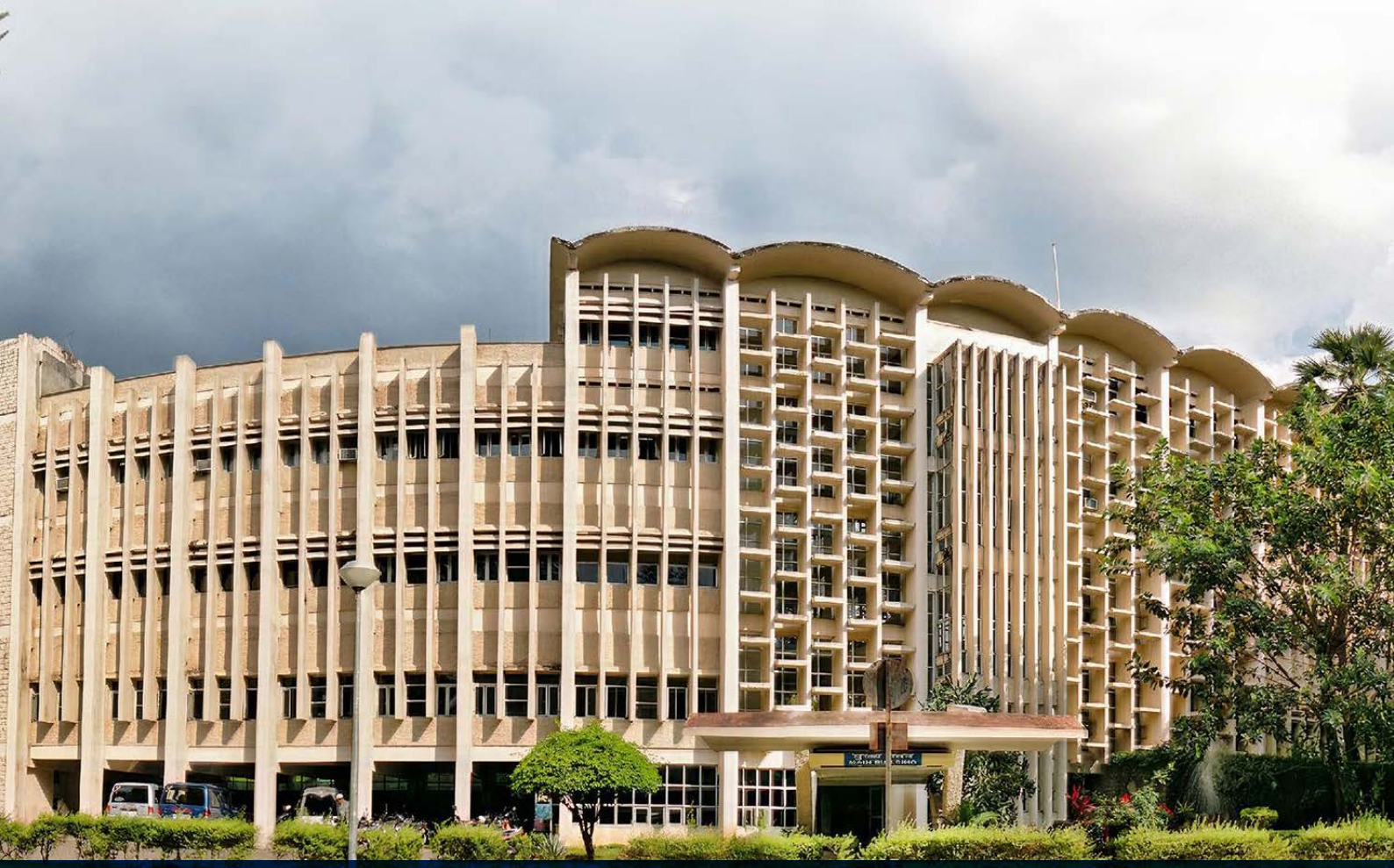
शैक्षिक प्रसार
Educational Outreach

IIT Bombay



e-POSTGRADUATE DIPLOMA IN

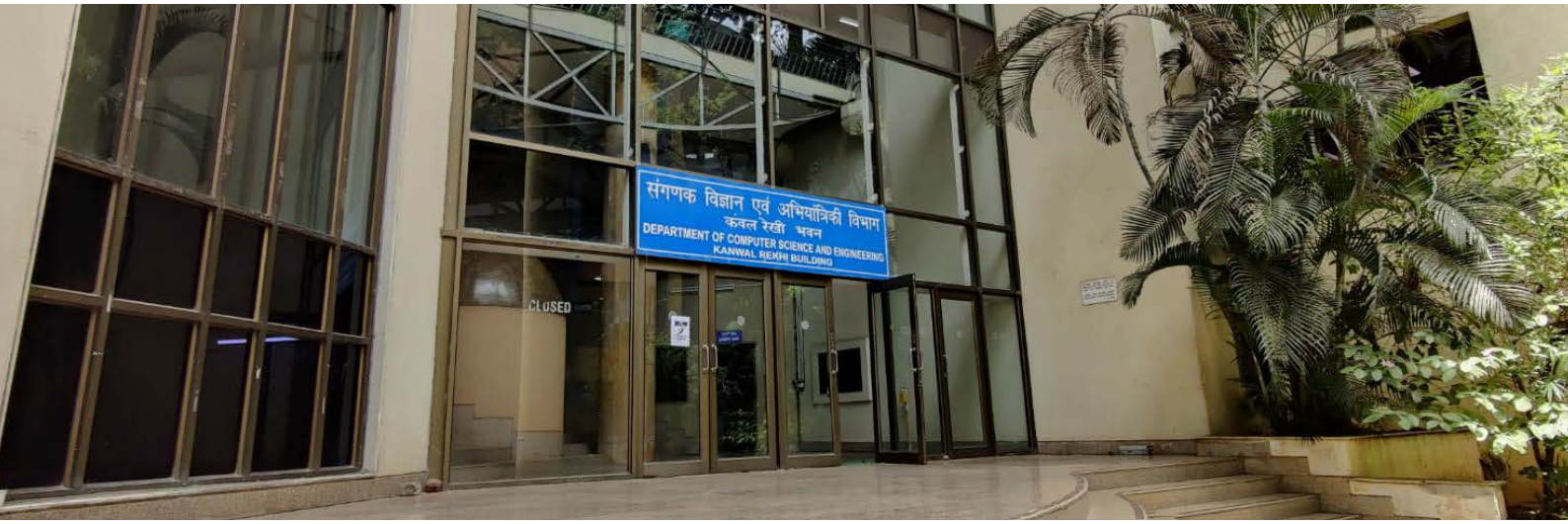
COMPUTER SCIENCE AND ENGINEERING

12 Months | Online

- DESIGNED AND DELIVERED BY IIT BOMBAY CSE FACULTY
- CAMPUS IMMERSION AT IIT BOMBAY
- CONCEPT-BASED CURRICULUM
- IIT BOMBAY DIPLOMA AND ALUMNI STATUS

This ePGD is offered by Department of Computer Science and Engineering (CSE), IIT Bombay

ABOUT CSE IIT BOMBAY



LEADING CSE DEPARTMENT IN INDIA

The Department of Computer Science and Engineering (CSE) at IIT Bombay has over **47 faculty members** and **1000+ students.** Consistently, top achievers of the **First 50 ranks (JEE Advanced)** have chosen CSE IIT Bombay (Undergraduate) and top achievers of the **First 100 ranks (GATE CS)** have chosen CSE IIT Bombay (Postgraduate).

ACCOLADES FOR FACULTY

The faculty have been honoured with several prestigious awards (for example, **Fellows of the ACM and IEEE,** holders of the **Infosys Prize, Bhatnagar Award**, the **Padma Shri** and the **Abdul Kalam National Innovation Fellowship**) and many other prestigious fellowships.

CUTTING-EDGE RESEARCH

CSE IIT Bombay produces over **100** research publications annually in top-tier conferences and journals, establishing its leadership in cutting-edge research. The faculty has attracted sponsored research projects worth **Rs. 50 crores.**

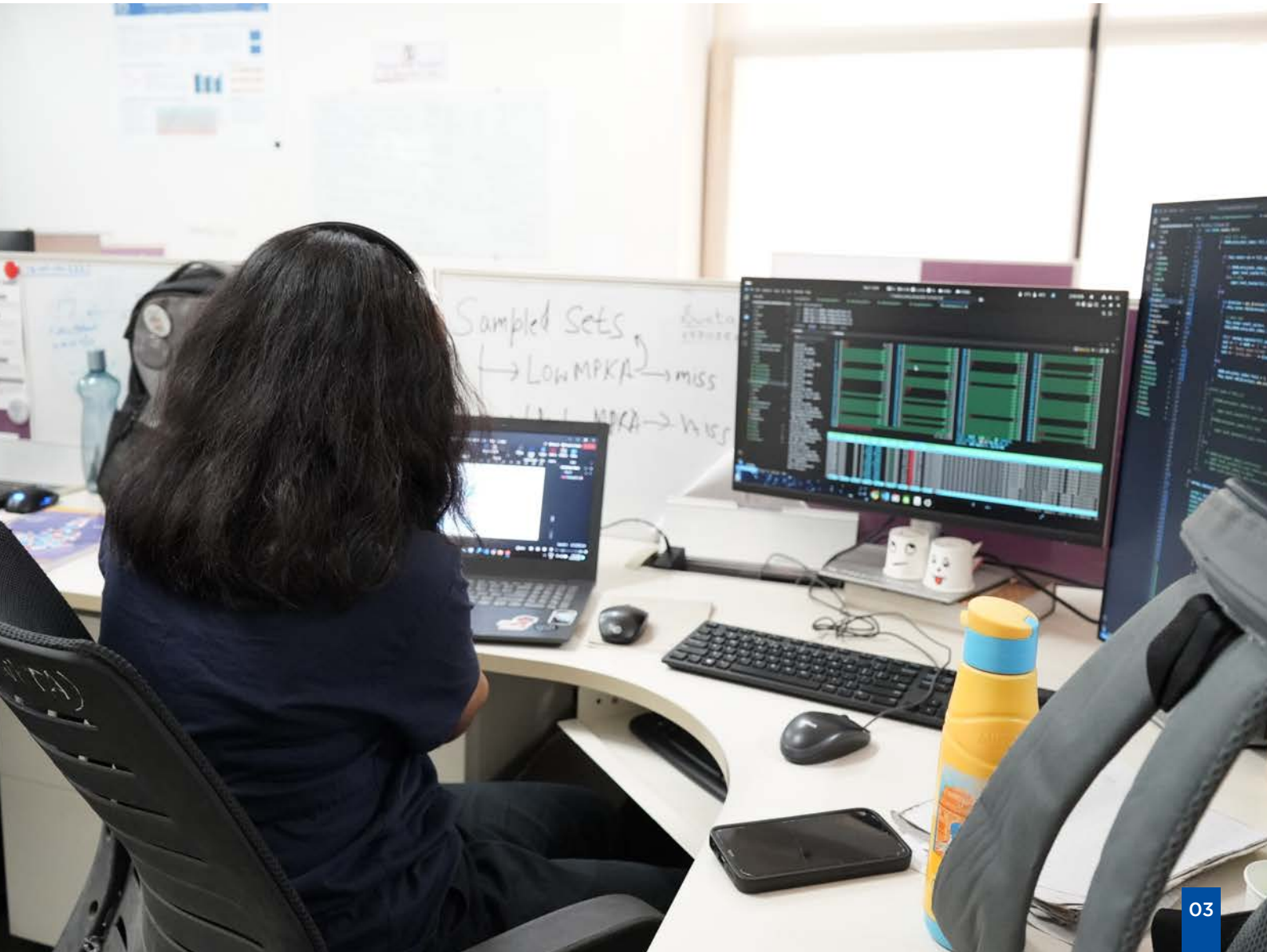
DISTINGUISHED ALUMNI

The illustrious alumni body comprises winners of the **President of India Gold Medal** and **Distinguished Alumni Awards,** along with leading global researchers, entrepreneurs, successful engineers and influential policymakers.

ABOUT THE e-POSTGRADUATE DIPLOMA

The **e-Postgraduate Diploma (ePGD) in Computer Science and Engineering (CSE)** from **IIT Bombay** aims to democratise access to high-quality postgraduate-level technical education, extending opportunities beyond IIT Bombay's traditional on-campus student body. This ePGD aims to empower a diverse and geographically dispersed audience, to significantly enhance their expertise and advance their careers. The mission of the ePGD in Computer Science and Engineering is to deliver cutting-edge, rigorous coursework, mirroring the standards of IIT Bombay's on-campus curriculum, to a broader audience through an innovative online delivery platform. The current focus areas of this ePGD encompass advanced programming, computing systems, and machine learning.

This ePGD is developed and delivered by IIT Bombay CSE faculty and will feature a mix of synchronous and asynchronous sessions, providing flexibility to the registered candidates. The ePGD also includes in-person final exams on the IIT Bombay campus. Candidates are required to successfully complete a set of rigorous courses along **with 36 credits**, culminating in the ePGD from IIT Bombay.



THE IIT BOMBAY EDGE

1

WORLD-CLASS FACULTY

Learn from IIT Bombay's distinguished faculty members from the CSE department

2

GRADUATION AT IIT BOMBAY

In-person graduation ceremony at IIT Bombay campus

3

IIT BOMBAY ALUMNI STATUS

Gain alumni status from India's top-ranked Institute

4

CAMPUS IMMERSION

Meet faculty and experience the IIT Bombay campus during campus visits

5

CAREER SUPPORT

Access IIT Bombay's Lateral Hiring Group

e-POSTGRADUATE DIPLOMA HIGHLIGHTS

- Designed and delivered by IIT Bombay CSE faculty
- Meet CSE faculty and experience IIT Bombay campus during campus visit
- Weekly live sessions from IIT Bombay CSE faculty for learning and query resolution
- Earn IIT Bombay credits which can be saved in the Academic Bank of Credits (ABC)
- Online 6-course curriculum designed for both working professionals and fresh graduates
- In-person graduation ceremony at IIT Bombay campus
- Participate in peer-to-peer learning and expand your professional network
- IIT Bombay alumni status
- Personalised assistance with a dedicated Programme Manager

WHO IS THIS ePGD FOR?

This ePGD in Computer Science Engineering is designed for motivated, technically adept individuals who seek to deepen their conceptual understanding and formalise their knowledge through a postgraduate qualification. These include:

Fresh Graduates with a terminal degree in computing who recognise the value of deepening their understanding beyond the undergraduate level.

IT Professionals aiming to stay at the forefront of technological advancements in computing systems.

Software Developers and **Engineers** looking to enhance their expertise in advanced programming and computing systems.

Professionals who are looking to advance their careers by gaining a prestigious postgraduate diploma.

Data Scientists and **Machine Learning Practitioners** seeking to solidify their theoretical foundation and expand their practical skills.

Individuals who have valuable on-the-job experience but lack formal postgraduate education.

KEY LEARNING OUTCOMES

The course electives on offer enable you to:

- Develop strong problem-solving skills and apply them to real-world challenges in software development, data analysis and system design
- Build expertise in designing, evaluating and securing complex computer systems
- Acquire foundational knowledge of machine learning and AI systems
- Master advanced programming tools and environments for efficient software development
- Stay at the leading edge of advancements in computing systems and technologies

WHAT THIS ePGD IS NOT?

Not a superficial skilling program

We prioritise a deep understanding of fundamental concepts over mere technical proficiency.

Not an undergraduate-level program or GATE preparation course

We focus on postgraduate-level topics and assume a foundational understanding of computer science principles.

Not a program for CXO-level executives solely interested in strategic decision-making

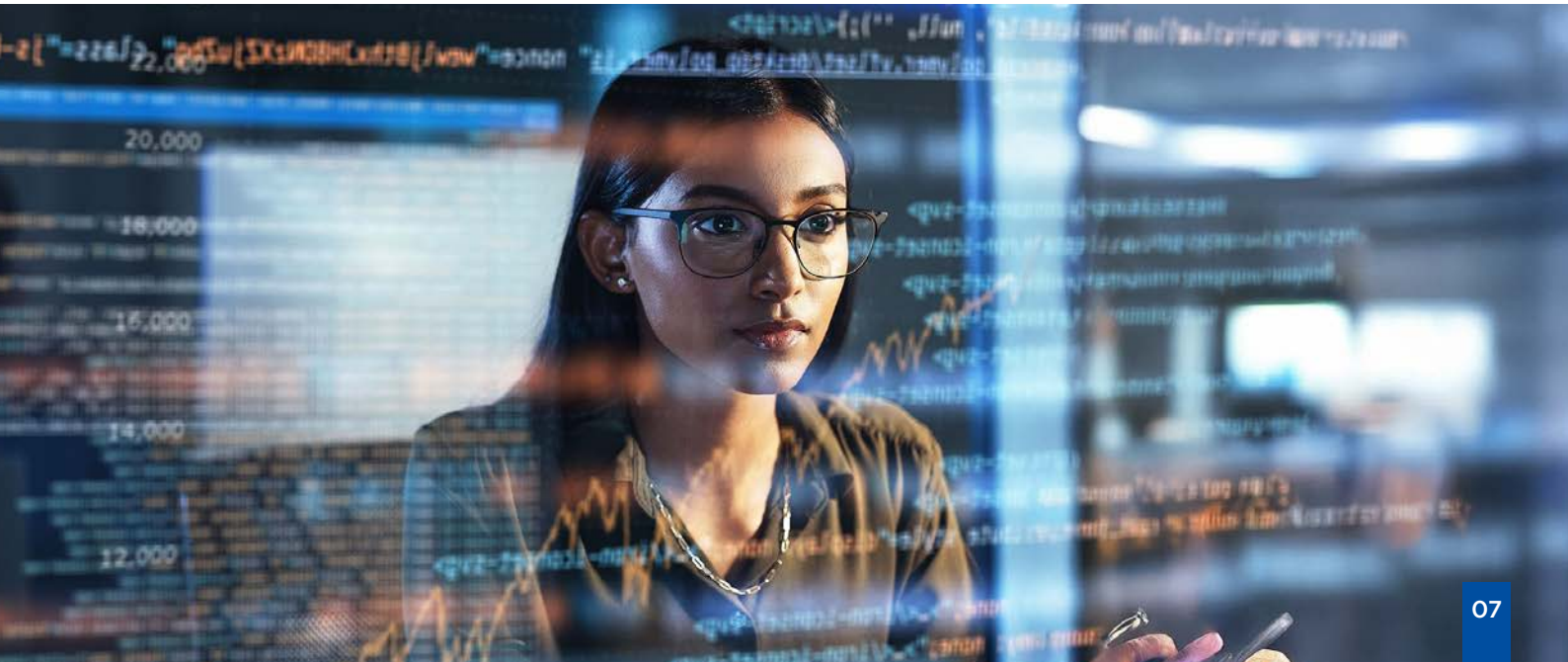
This ePGD emphasises technical depth and hands-on learning.

Not a short-term bootcamp

This is a rigorous e-postgraduate diploma that requires significant time and dedication.

Not a program that can be completed without significant individual study

This ePGD is expected to be challenging.



LEARN FROM IIT BOMBAY CSE FACULTY

PROF. PUSHPAK BHATTACHARYYA

Department of Computer Science and Engineering, IIT Bombay

Ph.D. | IIT Bombay

Research Interests: Natural Language Processing, Machine Learning, Machine Translation, Cross Lingual IR and Web Knowledge Processing

PROF. KAMESWARI CHEBROLU

Department of Computer Science and Engineering, IIT Bombay

Ph.D. | University of California, San Diego

Research Interests: Developing Cutting-edge Technology Involving High-end Web Technologies, Artificial Intelligence, Cloud Computing and Security for Real-world Applications with High Social Impact

PROF. ABHIRAM RANADE

Department of Computer Science and Engineering, IIT Bombay

Ph.D. | Yale University

Research Interests: Algorithms and Combinatorial Optimisation

PROF. VINAY J. RIBEIRO

Department of Computer Science and Engineering, IIT Bombay

Ph.D. | Rice University

Research Interests: Computer and Network Security (Blockchain, Intrusion Detection, IoT Security, DDoS)

PROF. AMITABHA SANYAL

Department of Computer Science and Engineering, IIT Bombay

Ph.D. | IIT Kanpur

Research Interests: Functional Programming, Compilers, and Programming Languages

PROF. SHARAT CHANDRAN

Department of Computer Science and Engineering, IIT Bombay

Ph.D. | University of Maryland

Research Interests: Computer Vision, Affective Computing, Artificial Intelligence

PROF. S. SUDARSHAN

Department of Computer Science and Engineering, IIT Bombay

Ph.D. | University of Wisconsin-Madison

Research Interests: Query Processing and Optimisation, Testing Database Queries, Optimisation of Data Access from Applications

Note: *This is an indicative list of faculty and is under the purview of IIT Bombay*

e-POSTGRADUATE DIPLOMA CURRICULUM

This e-Postgraduate Diploma requires candidates to successfully complete 36 IIT Bombay credits from CSE through a mix of courses, each of which will be of 6 credits. 9 courses are confirmed during the inaugural ePGD. These courses will be organised in three course baskets as mentioned below:

Course Basket	Courses Offered
A. Theory and Practice of Advanced Programming	1. The Program Developer's Toolbox 2. Algorithms and Complexity 3. Web and Software Security
B. Computing Systems	1. Cryptography and Network Security 2. Database and Big Data System Internals 3. Introduction to Blockchains
C. Artificial Intelligence and Machine Learning	1. Foundational Mathematics for Data Science 2. Natural Language Processing and Generative AI 3. Foundations of Computer Vision

This e-Postgraduate Diploma in Computer Science and Engineering requires candidates to complete 6 or more courses. Out of these, a candidate has to **pass at least 1 course from each one of the above course baskets.** The remaining courses can be from any basket.

A. THEORY AND PRACTICE OF ADVANCED PROGRAMMING

A1: The Program Developer's Toolbox

In this course, you will be introduced to essential tools and programming environments for software development. You will learn the Unix operating system, the C/C++ programming environment, and various software management tools. The course will cover the concepts behind Python programming, its popular libraries such as NumPy and SciPy, Web programming with HTML, CSS and JavaScript, and elements of AI programming. To solidify your understanding, you will complete a course project that demonstrates your grasp of the key concepts covered in the course.

Topics

- Unix and C/C++ programming environment
- Software management tools
- Python, NumPy and SciPy
- Web programming (HTML, JavaScript, CSS)
- Security and cryptography
- Reliable AI-enabled programming

A2: Algorithms and Complexity

In this course, you will explore foundational concepts of algorithms and computational complexity. You will learn fundamental techniques for solving computational problems like induction, recursion, divide and conquer, dynamic programming and greedy algorithms. You will gain a strong understanding of complexity theory, by studying concepts of undecidability, polynomial-time problems, complexity classes, NP-hardness and NP-completeness.

Topics

- Induction and recursion, divide and conquer
- Dynamic programming
- Greedy algorithms
- Bipartite matching
- Network flow and problem reductions
- Undecidability, polynomial-time complexity
- Complexity classes NP and co-NP, NP-hardness and NP-completeness

A3: Web and Software Security

This course provides a comprehensive overview of web and software security, focusing on key concepts such as web protocols, session management and server internals. You will explore both server-side and client-side vulnerabilities, and also software and OS security, including the fundamentals of Linux security. You will also learn the use of tools and frameworks like OWASP Top 10 vulnerabilities, CVE database and CVSS scoring, integral to understanding and mitigating cybersecurity risks.

Topics

- Web background (protocols, session management, server/browser internals etc)
- Web security tools (Firefox developer tools and OWASP ZAP)
- Server-side web attacks (featuring in OWASP top 10; SSRF, SQL injection, authentication/authorization vulnerabilities etc)
- Client-side web attacks (featuring in OWASP top 10; XSS, CSRF, CORS, Web sockets etc)
- Web security landscape and overall defense strategies
- Basics of Linux security
- Software based attacks (buffer overflow, format-string, race conditions etc) and best practices

B. COMPUTING SYSTEMS

B1: Cryptography and Network Security

In this course, you will learn both cryptography and network security, starting with an overview of confidentiality, crypto-analysis, data integrity, and cryptographic protocols. You will explore various network attacks across different layers of the protocol stack, such as Eavesdropping, ARP spoofing and DHCP attacks. The course also covers secure network protocols, firewalls and intrusion detection systems, providing you with the knowledge to secure and defend modern network infrastructures against potential threats.

Topics

- Confidentiality Primitives: Symmetric-key and Asymmetric key encryption
- Integrity Primitives: Hashes; Message Authentication Codes (MAC) and Digital Signatures
- Cryptographic Protocols: Key distribution and Public Key Infrastructure, Human and Cryptographic Authentication
- Case Study of TLS protocol
- Overview of Computer Networks
- Attacks at various layers of the network protocol stack (e.g. MAC flooding, ARP spoofing, DHCP/DNS attacks including DOS)
- Secure Network Protocols (IPsec, DNSSEC)
- Firewalls and Intrusion Detection Systems

B2: Database and Big Data System Internals

In this course, you will explore the internals of database systems, covering key concepts such as data storage, indexing, query processing and transaction management. You will learn database system architectures, the internals of big data systems and the challenges of parallel and distributed storage and query processing. The course will provide a strong foundation in building and managing real-world database systems through hands-on assignments with open-source databases and big data systems.

Topics

- Database system internals: data storage, indexing, query processing, query optimisation, transactions and concurrency control
- Database system architectures
- Introduction to big data systems
- Parallel and distributed storage
- Parallel and distributed query processing
- Recovery mechanisms
- Parallel and distributed transaction processing

B3: Introduction to Blockchains

In this course, you will explore the motivation and real-world applications of blockchain systems. You will gain an understanding of peer-to-peer and distributed systems, and their core concepts such as consensus mechanisms, Byzantine fault tolerance and impossibility results. The course will also introduce cryptographic tools essential for the functioning of blockchains. You will study Bitcoin, its Proof-of-Work consensus and potential attacks like double spending and selfish mining. You will also examine energy efficiency in blockchain, comparing Proof of Stake with Proof of Work consensus models. You will also be introduced to layer-2 scalability solutions such as Lightning Network and Rollups. You will develop smart contracts in Solidity for Ethereum and test them on your personal Ethereum blockchain.

Topics

- Motivation and applications of blockchain systems
- Introduction to peer-to-peer and distributed systems (Consensus, byzantine fault tolerance, impossibility results)
- Cryptographic tools used in blockchains
- Bitcoin: Proof-of-Work (PoW) consensus, block structure and other details
- Attacks on Bitcoin: double spending and selfish mining
- Energy saving: Proof-of-Stake (PoS) and comparison with Proof-of-Work (PoW)
- Layer-2 Scalability Solutions: Lightning Network and Rollups
- Solidity Smart Contracts for Ethereum

C. ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

C1: Foundational Mathematics for Data Science

In this course, you will learn mathematical techniques that are essential in solving problems traditionally considered challenging for computational machines. You will gain a strong understanding of key methods in linear algebra, statistics and multivariate calculus that are widely used in machine learning. By the end of the course, you will be equipped to apply these mathematical concepts to real-world tasks such as automatic face recognition with pose variations, optimising neural networks and generating realistic images.

Topics

- Linear algebra methods
- Statistical techniques
- Multivariate calculus
- Machine learning applications
- Automatic face recognition with pose variations
- Optimisation methods for neural networks
- Generating realistic pictures

C2: Natural Language Processing and Generative AI

In this course, you will learn the foundational concepts of machine learning, deep learning and Generative AI. The course will cover Feed-Forward Neural Networks (FFNN) backpropagation techniques, as well as applications of word vectors in Natural Language Processing. You will explore different kinds of Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), and learn how they are built, trained and used. You will also study LSTM networks, RCNN, Encoder-Decoder architectures, with a focus on autoregression, self-attention and cross-attention mechanisms used in Large Language Models.

Topics

- Machine learning basics, deep learning and Generative AI concepts
- Single Neuron Computation: Perceptron, Sigmoid neurons
- Feed-Forward Neural Networks (FFNN) and backpropagation, word vectors
- Convolutional Neural Networks (CNN) and image captioning application of CNN
- Recurrent Neural Networks (RNN), Hopfield networks and Boltzmann machines, Backpropagation Through Time (BPTT) and vanishing/exploding gradient
- Long Short-Term Memory (LSTM) networks, Recurrent Convolutional Neural Networks (RcNN), encoder-decoder and decoding methods (autoregression, self-attention, cross-attention)

C3: Foundations of Computer Vision

In this course, you will learn the fundamental concepts and challenges in computer vision, starting with image formation and the camera matrix. You will study the techniques of homographies and calibration, stereo vision, image filtering, filter banks, as well as convolutional neural networks (CNNs) and visual transformers. You will also explore various applications of computer vision, such as classification, segmentation, inpainting, style transfer, motion analysis and depth prediction.

Topics

- Challenges in vision, image formation and the camera matrix
- Homographies
- Calibration, stereo
- Image filtering, filter banks
- Convolutional neural networks
- Vision transformers
- Applications in classification, segmentation, inpainting, style transfer, motion, and depth prediction

Note: *Curriculum review and changes are under purview of IIT Bombay and would be undertaken from time to time to ensure the curriculum coverage is in line with industry requirements.*

LANGUAGES AND TOOLS COVERED

The course electives on offer cover a variety of languages and tools, such as the following:

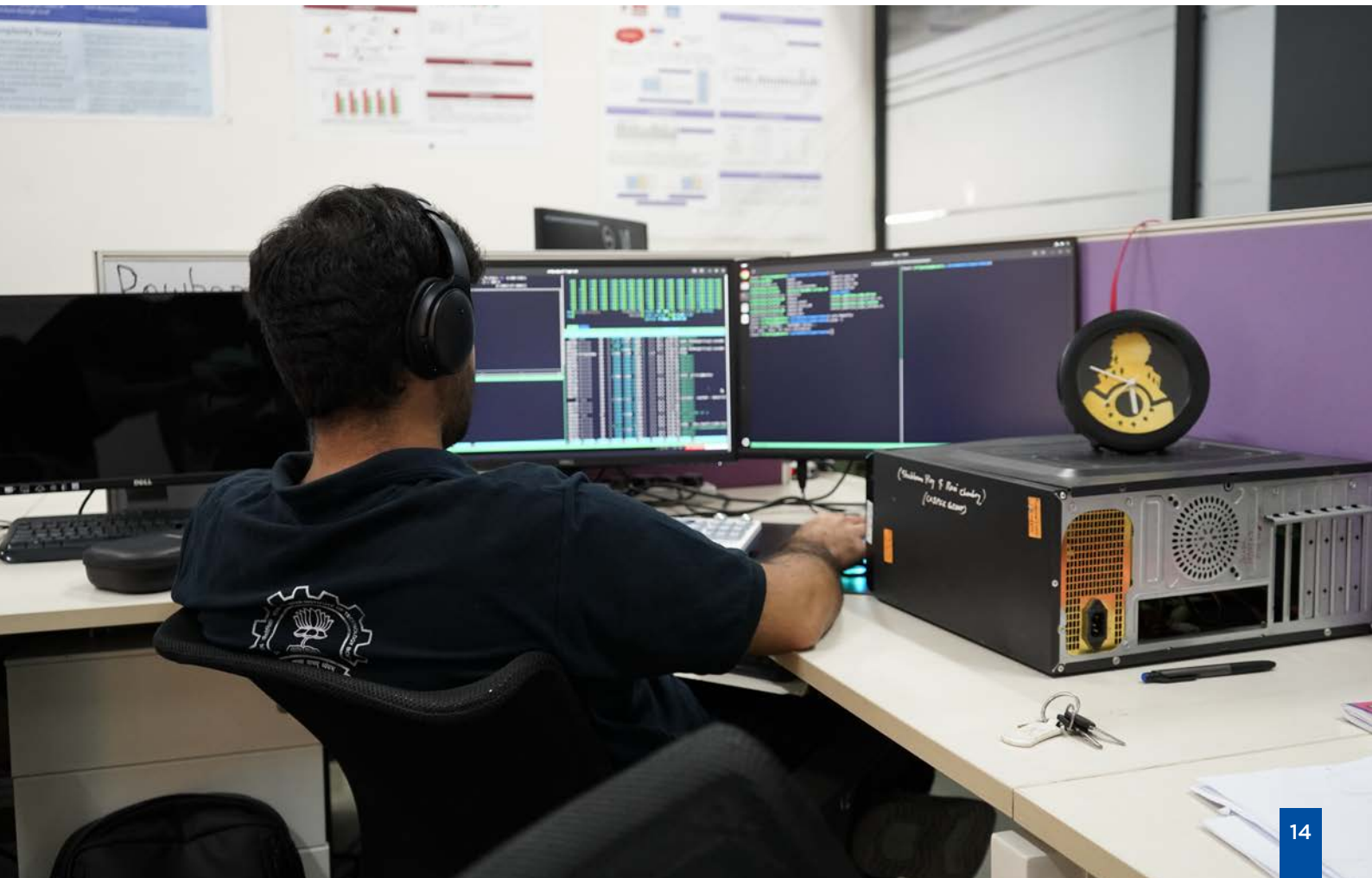
C++ | python | SQL | JavaScript

CSS | RUST CONSOLE EDITION | NumPy | SciPy

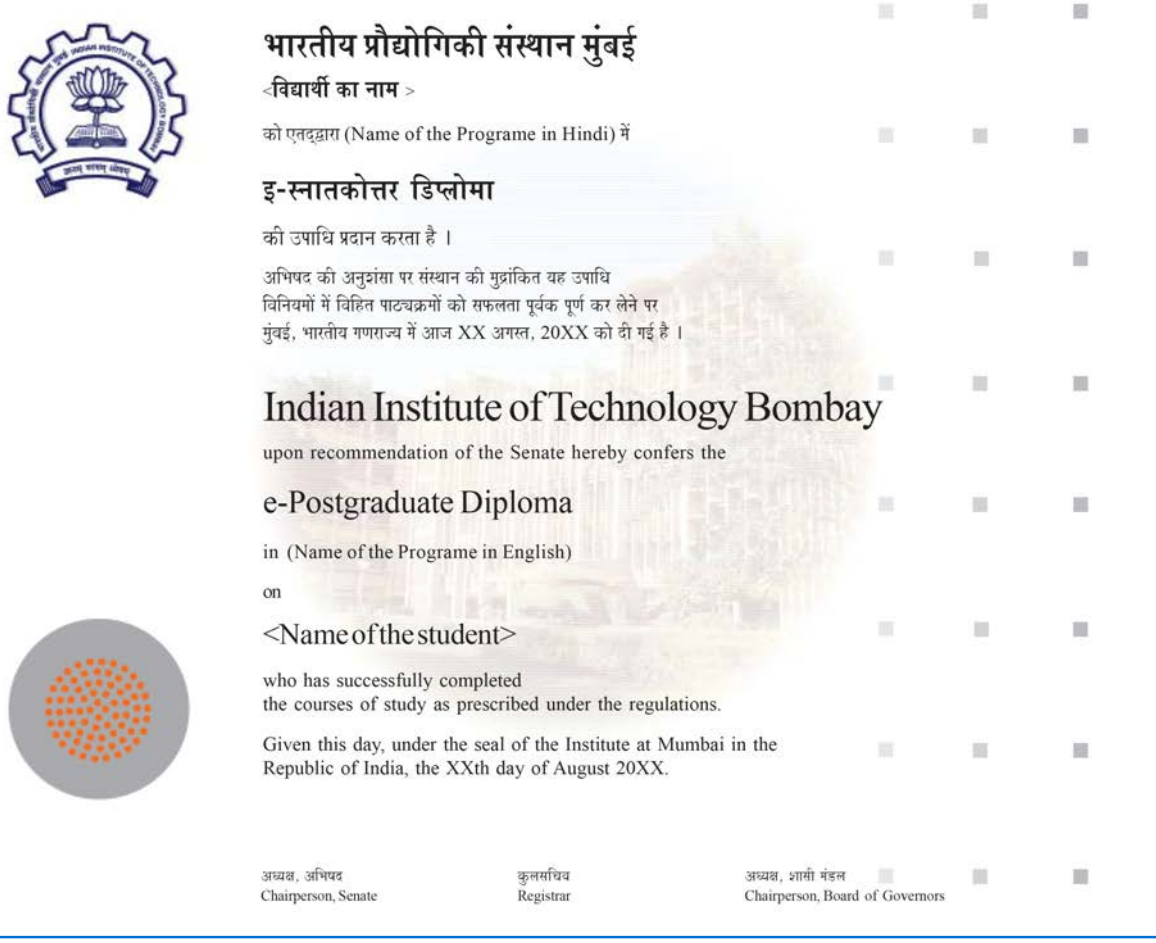
OWASP Zed Attack Proxy | django | git | docker

WIRESHARK | OpenSSL Cryptography and SSL/TLS Toolkit | and many more

Note: *Languages and tools used are under the purview of the faculty and a thorough review would be undertaken from time to time to ensure the programme coverage is in line with industry requirements.*



SAMPLE e-POSTGRADUATE DIPLOMA



भारतीय प्रौद्योगिकी संस्थान मुंबई

<विद्यार्थी का नाम >

को एतद्द्वारा (Name of the Programe in Hindi) में

इ-स्नातकोत्तर डिप्लोमा

की उपाधि प्रदान करता है ।

अभिषद की अनुशंसा पर संस्थान की मुद्रांकित यह उपाधि
विनियमों में विहित पाठ्यक्रमों को सफलता पूर्वक पूर्ण कर लेने पर
मुंबई, भारतीय गणराज्य में आज XX अगस्त, 20XX को दी गई है ।

Indian Institute of Technology Bombay

upon recommendation of the Senate hereby confers the

e-Postgraduate Diploma

in (Name of the Programe in English)

on

<Name of the student>

who has successfully completed
the courses of study as prescribed under the regulations.

Given this day, under the seal of the Institute at Mumbai in the
Republic of India, the XXth day of August 20XX.

अध्यक्ष, अभिषद
Chairperson, Senate

कुलसचिव
Registrar

अध्यक्ष, शासी मंडल
Chairperson, Board of Governors

ELIGIBILITY CRITERIA

The eligibility criteria for the e-Postgraduate Diploma in Computer Science and Engineering requires a candidate to have at least one of the following from a recognised university:

- B.E. / B.Tech / BS (4 year) / M.Sc. or higher degree in Computer Science/Engineering, Information Technology, Artificial Intelligence, Data Sciences, Mathematics and Computing or equivalent (*) disciplines

OR

- B.E. / B.Tech / BS (4 year) or higher degree in any engineering discipline **and** any one of the following:
  - Qualifying GATE score in Computer Science or Data Science
  - Two years **relevant** work experience in Computer Science, Artificial Intelligence, or Data Sciences
  - A minor in Computer Science, Information Technology, AI and ML, Data Science or equivalent (*) in programmes which offer such minors

OR

- MCA (with undergraduate degree as BCA or B.Sc., and Mathematics as a subject)

(*) Final word on equivalency will rest with IITB CSE Department

SELECTION PROCESS

Step 01

Application

Interested candidates can apply for the e-Postgraduate Diploma by filling out a simple online application form.

Step 02

Online Test & Screening Call

Applicants must take an online test to assess their foundational knowledge and suitability for the ePGD. After passing the online test, applicants will go through a mandatory screening call with the Registration Office.

Step 03

Offer of Registration

The selected candidates will receive an offer letter to join the ePGD. They will need to pay the registration fee to secure their seat and complete the registration.

FEE STRUCTURE

REGISTRATION FEE	**₹60,000 + GST**	*(To be paid within 7 days after receiving the offer letter to confirm the registration)*
FEE FOR 1ST COURSE	**₹90,000 + GST**	*(To be paid at the beginning of 1st course)*
FEE FOR 2ND COURSE	**₹90,000 + GST**	*(To be paid at the beginning of 2nd course)*
FEE FOR 3RD COURSE	**₹90,000 + GST**	*(To be paid at the beginning of 3rd course)*
FEE FOR 4TH COURSE	**₹90,000 + GST**	*(To be paid at the beginning of 4th course)*
FEE FOR 5TH COURSE	**₹90,000 + GST**	*(To be paid at the beginning of 5th course)*
FEE FOR 6TH COURSE	**₹90,000 + GST**	*(To be paid at the beginning of 6th course)*

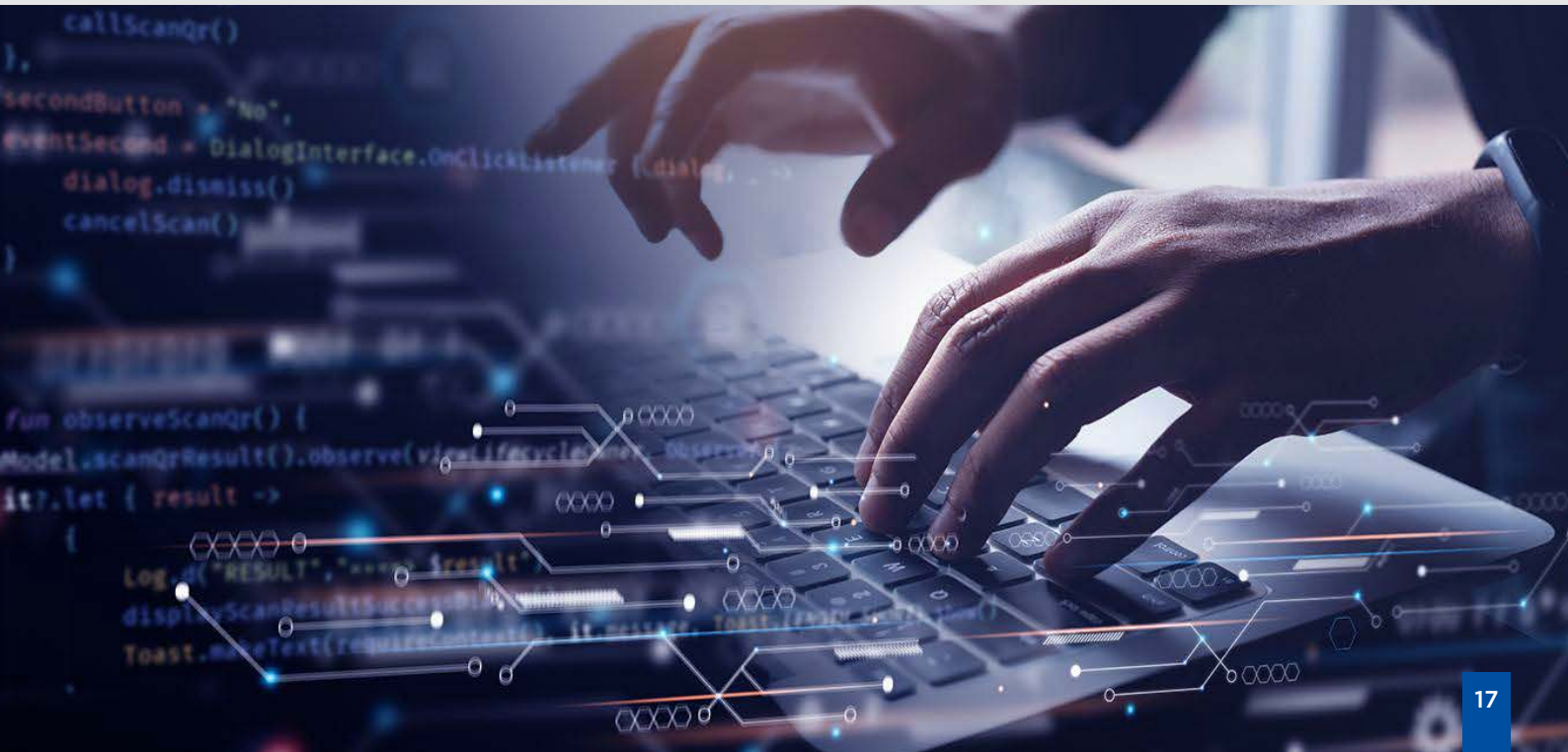
TOTAL FEES: ₹6,00,000 + GST

EXCLUSIVE OPPORTUNITY

Join the first cohort of the IITB-ePGD-CSE and avail a special inaugural fee offer.

For more details on flexible fee payments, please get in touch with the Registration Team.

Note: *Multiple courses will be offered simultaneously. Total fees can be paid accordingly.*



ABOUT GREAT LEARNING

Great Learning
POWER AHEAD

Great Learning is the ed-tech partner for this e-Postgraduate Diploma and a leading global ed-tech company specializing in professional learning and higher education. It offers comprehensive, industry-relevant, and hands-on learning programs across various business, technology, and interdisciplinary domains driving the digital economy. These programs are developed and offered in collaboration with the world's foremost academic institutions in various formats, including certificate programs, diplomas and degrees. Great Learning leverages its highly qualified, world-class faculty and a vast network of 7600+ industry expert mentors to deliver an unmatched learning experience to more than 12 million learners from over 170 countries worldwide.

12 Million+
Registered Learners

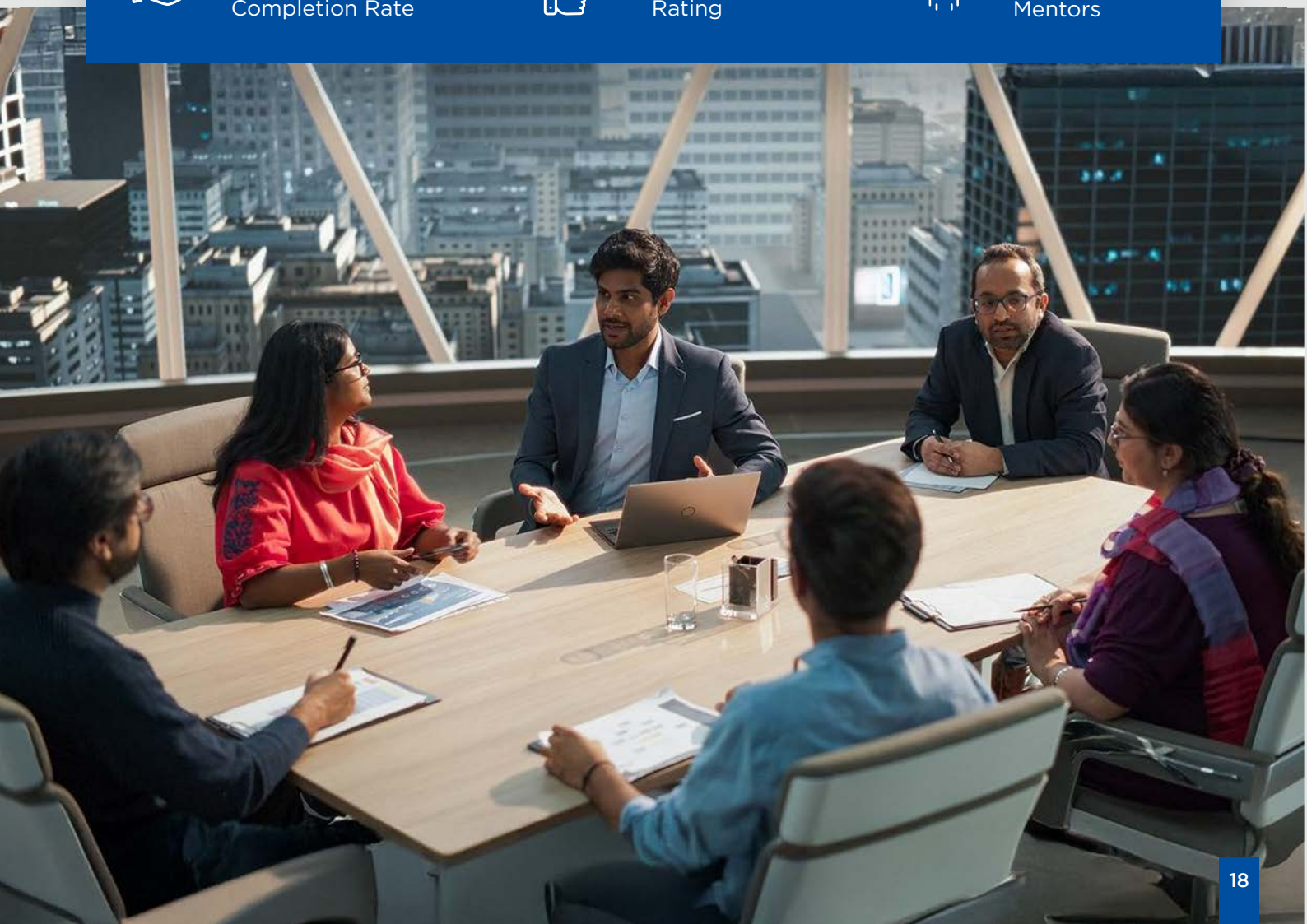
170+
Countries

400 Million+
Learning Hours Delivered

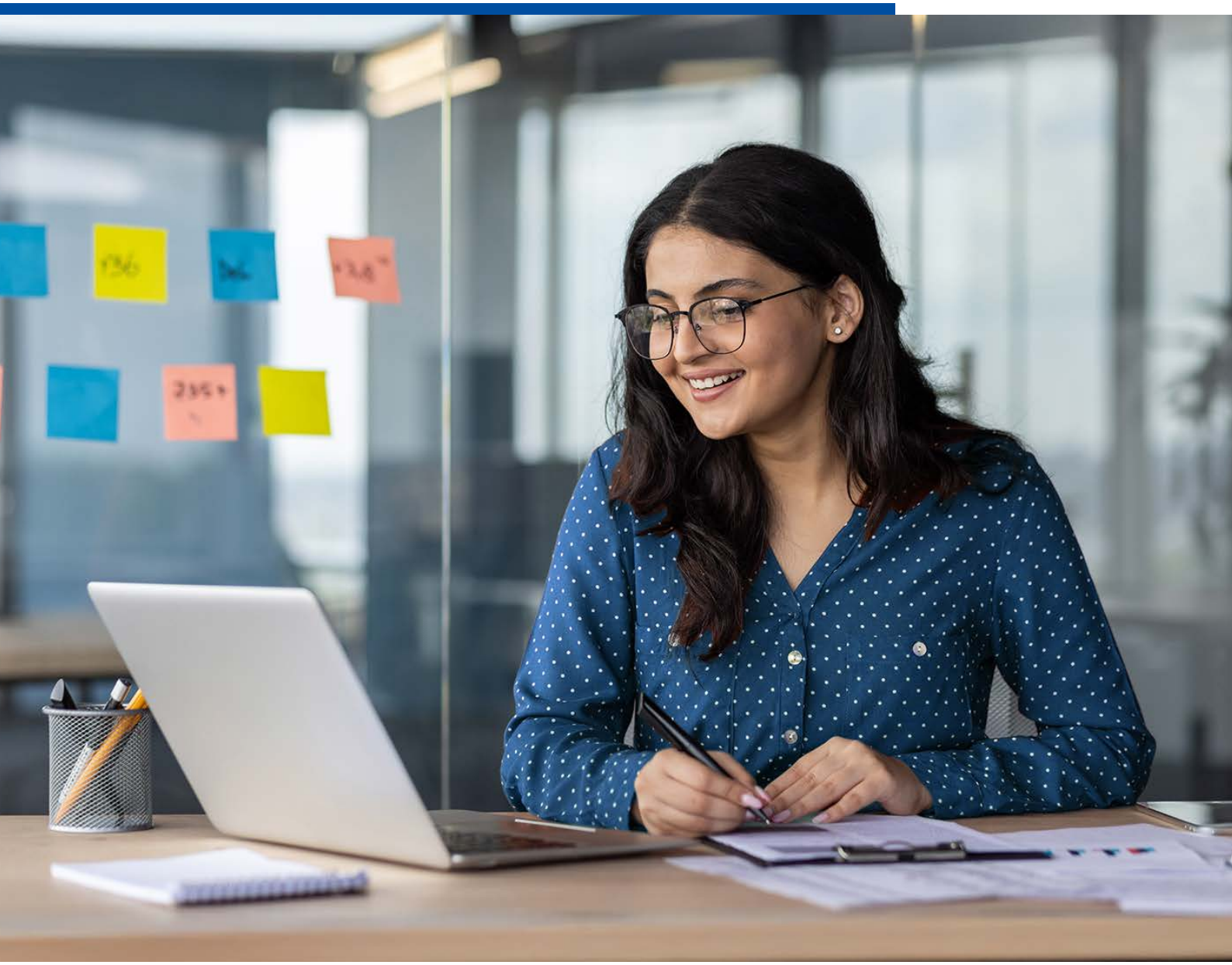
90%
Course Completion Rate

>4.5/5.0
Learner Rating

7600+
Industry Mentors



READY TO ADVANCE YOUR CAREER?



CONTACT US

iitb_epgd.cse@greatlearning.in | epgd.cse@eo.iitb.ac.in

080 4680 1947

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