भारतीय प्रौद्योगिकी संस्थान दिल्ली
Indian Institute of Technology Delhi

Advanced Certification in Data Science and Decision Science

(Batch 03)

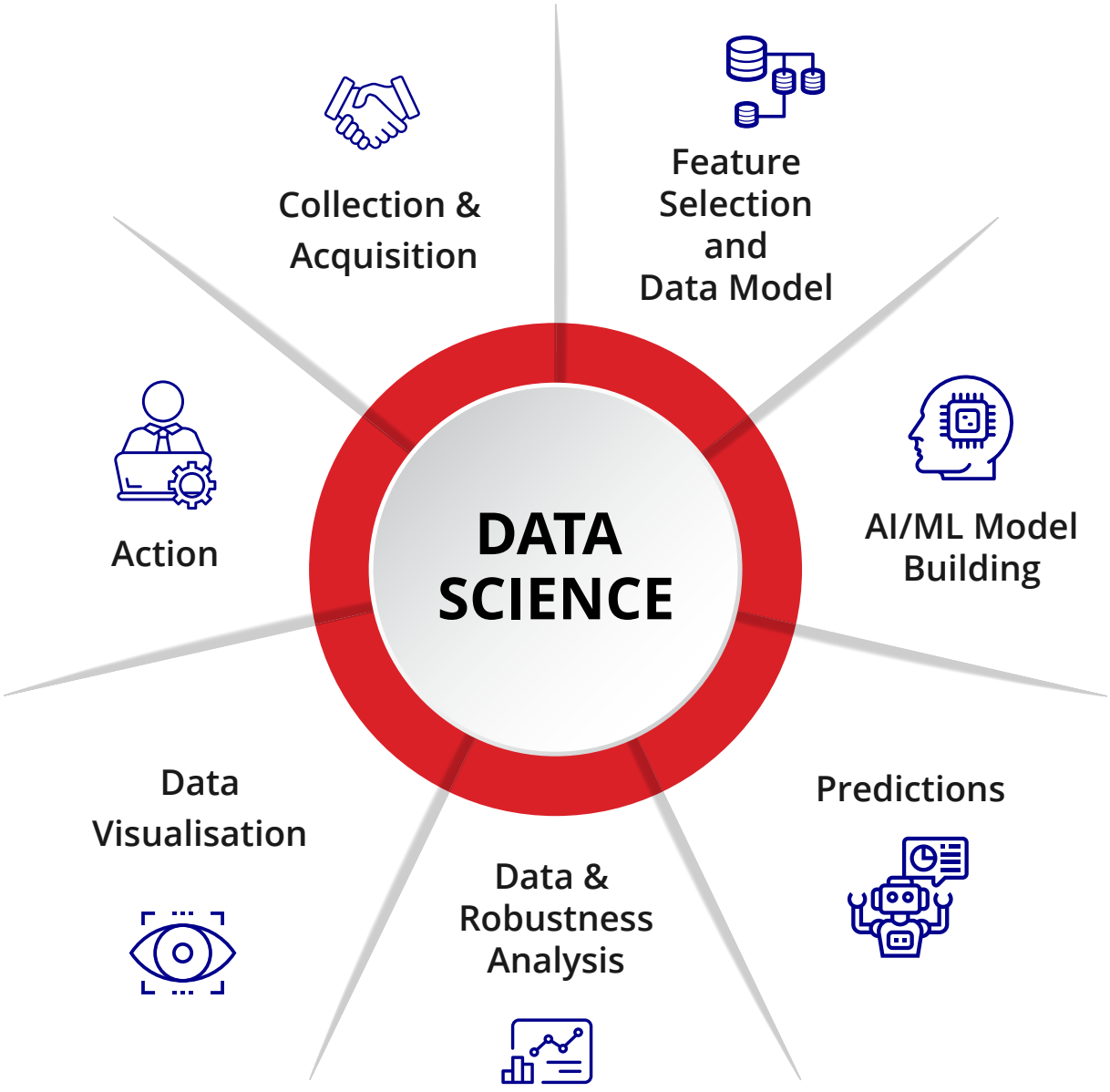
12 Months | Starts 9th, March 2024 | Live Interactive Lectures

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

The Data Scientist

Data Science is an interdisciplinary field focused on extracting knowledge and insights from typically large data sets (big data), and applying them to solve businessproblems in a wide range of application domains by unifying statistics, mathematical models, machine learning, artificial intelligence and data visualisation with business rules. Data Science, however, is different from Computer Science and Information Science since value of the business outcome is crucial in this context.

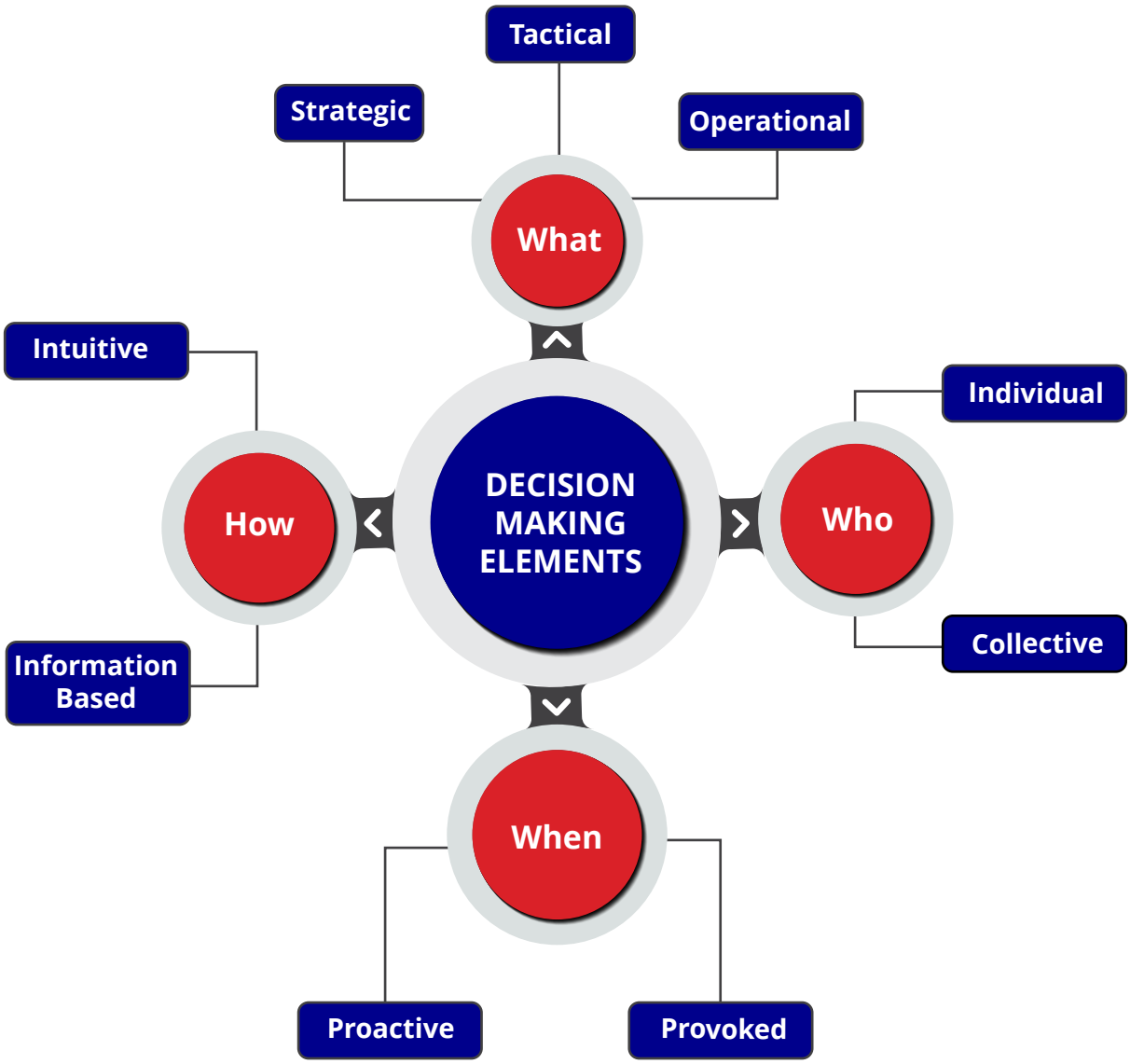
Data Scientists create mathematical models and combine it with statistical knowledge and machine learning to predict events and generate counter-intuitive insights from data. They seek to understand, interpret, and analyse data with the goal of augmenting products and processes in firms. Hence, data scientists build upon a variety of knowledge areas to generate causal inferences on complex business problems using methods stemming from machine learning and statistics.



The Science of Decision-Making

Decision Science is the interdisciplinary application of business, mathematics, technology, design thinking and behavioural science. Decision Science integrates and builds upon Data Science by adding business context, design thinking, and behavioural science.

Decision Scientists skilfully blend business, math, technology and behavioural science with good and precise communication. This diverse skill set allows decision scientists to help businesses make informed decisions.



Data Science and Decision Science can be combined to solve business problems. Decision Scientists with exceptional understanding of business goals, can apply Data Science skills to define and solve business problems.

Programme Highlights

- A programme from DMS, IIT Delhi. DMS is ranked #5 in NIRF (2023) and IIT Delhi is ranked 2nd in QS World University Rankings 2024 in India
- Curriculum covers contemporary concepts and tools of data and decision sciences
- Capstone project
- IIT Delhi Continuing Education Programme (CEP) Certificate

Roles and Career Paths in Data Science and Decision Science

- Business Analyst
- Data Analyst
- Data Scientist
- Decision Scientist
- Data Architect

Who Should Attend?

- Professionals aspiring to gain a foothold in the data sciences and analytics domain.
- Data Science professionals seeking to gain an in-depth knowledge of the key aspects of analytics and decision sciences.
- Experienced leaders willing to deep dive into decision sciences to gain assistance in decision-making.

Learning Outcomes

Develop a strong understanding of different types of data analytics, artificial intelligence and machine learning algorithms, and mathematical models

Develop a strong focus and problem-solving logic for handling complex data problems for management decision-making involving data science and decision science.

Develop an acumen towards problem solving for complex data analysis with an algorithmic and systematic approach, which is techno-functional in nature.

Develop an acumen to understand and analyse large datasets with descriptive, predictive, prescriptive, and cognitive science algorithms.

Enable problem solving ability through hands on exercises and capstone projects.

Programme Curriculum

Modules covered under both verticals are listed below. However, the sequence of sessions may vary depending on inter-dependency and relatedness of themes.

Data Science Vertical

Module I: Governance of Enterprise Analytics and AI/ML Systems

Learning Outcome:

This module will spread across the course. After completing this module, learners would be expected to understand the types of enterprise applications of analytics and AI/ML projects and how governance and policies of senior management need to address adverse outcomes.

Topics Covered:

- Introduction to Management of Systems in Enterprises and Industries
- Types and Levels of Analytics Systems
- Understanding the Evolution of SMAC Era for Enterprise Systems
- Challenges of Managing Artificial Intelligence and Machine Learning Projects
- Fairness, Accountability, Transparency, and Ethics in AI/ML
- Challenges and Benefits of Generative AI

Module II: Inferential Analytics

Learning Outcome:

Learners should understand basic approaches of data analysis, data manipulation and visualization. Statistical analysis of multi-dimensional data and its interpretation should be achieved.

Topics Covered:

- Statistics 101 and Descriptive Analytics Using MS Excel and SPSS/PSPP
- Data Visualisation

- Python Programming for Data Management
- Python for Descriptive, Diagnostic and Inferential Statistics
- Prescriptive Analytics Using MCDM/AHP

Module III: Predictive Analytics and Machine Learning

Learning Outcome:

Learners should learn different mathematical methods of machine learning and also when they need to be used and for which type of data. Learning nature of different types of objectives feasible (and also not feasible) using machine learning will be a major focus.

Topics Covered:

- Data Mining Approaches for Predictive Analytics
- Supervised and Unsupervised Learning
- Regression and Multivariate Analysis Using SPSS/PSPP
- Data Multidimensionality
- Data Model Building for Big Data Applications
- Machine Learning Using Artificial Neural Networks
- Deep Learning
- Fuzzy Set Theory
- Machine Learning Using Bio Inspired Computing Algorithms

Module IV: Cognitive Science and Big Data Analytics

Learning Outcome:

Learners would be able to transition from structured data towards unstructured data. Objective is to understand how meaning and actions can be generated from trace data generated by users in different platforms like internet search, social media and website chatbots. Competitive intelligence and process automation is a major learning in this module.

Topics Covered:

- Deep Learning Using Convoluted Neural Networks
- Big Data Applications
- Understanding Natural Language Processing Applications (e.g. Search Engines and Social Media)
- Web Analytics (Google)
- Social Media Analytics

- Advanced Text Mining Like Sentiment Analysis, Topic Modeling and Text Summarisation
- Advanced Network Science and Applications
- Machine Learning Applications and Chatbots
- Generative Artificial Intelligence and Large Language Models

Module V: Tools for Data Science

Learning Outcome:

This module will spread across the programme and will enable learners to use tools for data analysis and translate theoretical concepts to practice for solving data related problems.

Topics Covered:

- Hands-on with Machine Learning for Supervised and Unsupervised Learning
- User Interface-driven Python Applications for Machine Learning (Orange)
- Python Programming for Machine Learning Applications
- Text Mining and Natural Language Processing Using Orange

Programme Curriculum

Decision Science Vertical

Module I: Overview on Analytics for Business Decisions

Learning Outcome:

This module will provide detailed understanding on the three pillars of analytics i.e. Predictive, Prescriptive and descriptive for business decisions. In addition, this module creates a foundation for analytics with the help of an illustrative example. At the end, learners would be able to clearly differentiate the difference among Predictive, Prescriptive and descriptive analytics.

Topics Covered:

- Understanding of Main Pillars of Business Decision Analytics
- Introduction to Heuristics/Meta-Heuristics/Hyper-Heuristics/AI
- Application of Decision-making Models

Module II: Prescriptive Analytics

Learning Outcome:

This module focused primarily on prescriptive analytics and its application in business decisions. Case illustrations will be taken to show the modelling part of prescriptive analytics with the help of Excel Solver, and LINGO. At the end, learners would be able to develop in-depth understanding on modelling and solving the business problems through the prescriptive analytics.

Topics Covered:

- Understanding Quantitative Data Analysis and Prescriptive Analytics
- Linear Programming (Single Objective) Using Excel/LINGO
- Non-Linear Programming (Single Objective) Using Excel/LINGO
- Linear Programming (Multiple Conflicting Objectives)
- Goal Programming Using Excel/LINGO
- Applications of Linear Programming/Non Linear Programming in Business
- Predictive Analytics Using EXCEL/R

Module III: Business Simulation and Predictive Analytics

Learning Outcome:

This module focused on business simulation and prescriptive analytics, and its application in business decisions. Simulation using Excel spreadsheet will be used to provide an informed decision to the future events. In addition, various predictive analytical tools such as Exponential Model, Winter Model & Winter-Holtz Model will be discussed in Excel spreadsheet and R Script. At the end, learners would be able to develop in-depth understanding on the use of business simulation using Excel and predictive analytical tools using Excel and R script.

Topics Covered:

- Introduction to Basic Statistics such as Population and Sample
- Measure of Central Tendency, Dispersion and Association
- Simulation Modelling and Analysis Using Excel
- Application of Simulation in Business Decisions
- Demand Forecasting in Business Decisions
- R for Predictive Analytics (Demand Forecasting)
- Applying AI (Genetic Algorithm) in Business Decisions Using Excel

Module IV: Descriptive and Qualitative Data Analytics

Learning Outcome:

This module focused on third and last analytics i.e. descriptive analytics. Several Multi Criteria Decision Making (MCDM) tools such as AHP, ANP, IRP, TOPSIS, BWM, ELECTRE, ISM, and DEMATEL would be discussed in detailed and its applications with the help of case illustrations. At the end, learners would be able to understand clearly the role of descriptive analytics in business problems and how to tackle those using descriptive analytics.

Topics Covered:

- Understanding Qualitative Data Analysis and Descriptive Analytics
- Introduction to Multi Criteria Decision-making
- Group Decision-making
- ISM, MICMAC Analysis, IRP, DEMATEL, TOPSIS, ELECTRE
- Hybridisation of MCDM such as IRP-AHP, ISM-AHP, AHP-TOPSIS
- Qualitative Data Analysis from Most Likely, Pessimistic, and Optimistic Algorithms
- Aggregation of Ranking Variations Using MILP in Excel/LINGO

Module V: Decision Science Tools and Case Studies

Learning Outcome:

This would be the last module where the learners in a group of 3-5 members would be provided a case study. Each case study related with the context of some business problems need to be solved with the help of one or combined approach of three analytics discussed in Module II, Module III & Module IV. All groups would present their analytical approach to offer business solutions. These case studies would fall in some areas of business decisions such as production, logistics, marketing, human resource, vendor/material/technology selection, finance etc. At the end of this module, learners would definitely understand the role and application of three pillar of analytics in business problems.

Topics Covered:

• Case study discussions from several domains of businesses viz, marketing, production, human resource, finance, and strategy using Excel/LINGO.

Projects

1. Capstone project in decision science using descriptive, predictive, and prescriptive analytics.
2. Capstone project in data science using machine learning involving supervised and unsupervised learning on structured/semi-structured data.

Tools

Programme Details

Eligibility

- All graduates are eligible to apply for this programme.
- Preference is for working professionals with an academic background, which indicates a basic aptitude in technical and quantitative subjects so that they can cope up with the programme contents.

Duration

12 months
150 hours of live online teaching
- 50 sessions of three hours each
- Two sessions to be conducted each day for 25 days (Mostly Sundays)

Delivery

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

Class Schedule

Alternate Weekends 9:00 AM to 6:00 PM with lunch break in-between.

Admission Criteria

Selection based on application review and personal interview.

Evaluation

- Each vertical, Data Science and Decision Science will have equal weightage of 100% each.
- 40% - Two examinations for each vertical i.e., Data Science and Decision Science
- 40% - Capstone Project Implementation
- 20% - Case studies, in-class assessments, and data/mathematical modelling problems

Certification*

- Candidates who score at least 50% marks overall and have a minimum attendance of 50%, will receive a 'Certificate of Successful Completion' from CEP, IIT Delhi.
- Candidates who score less than 50% marks overall and have a minimum attendance of 50%, will receive a ‘Certificate of Participation' from CEP, IIT Delhi.
- The organising department for this programme is the Department of Management Studies, IIT Delhi.

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

Programme Coordinator

DR. ARPAN KUMAR KAR

Chair Professor & Professor

Department of Management Studies &
School of Artificial Intelligence,

Indian Institute of Technology Delhi

Prof. Arpan Kumar Kar is a full Professor in Indian Institute of Technology Delhi, India. He holds the ASG Endowed Chair Professorship in the space of data and decision science. Within IIT Delhi, he holds a joint appointment between Department of Management Studies and Yardi School of Artificial Intelligence. Administratively, he chairs Corporate Affairs and is a member of the Board of Academic Programme and Advisory Committee for the Overall Curriculum Development Cell. His research and teaching interests are in the domain of data science, artificial intelligence, digital transformation, internet ecosystems, social media and ICT-based public policy. He has supervised over 12 doctoral students and over 75 masters dissertations.

In total, he has authored over 200 scientific publications and edited over 12 books. Among these, he has authored over 75 journal publications in established scientific journals (ABDC A, ABS 3 and WoS Q1 journals) and 14 publications in ABDC A* journals. He has been cited over 11000 times with an H index of 50 and i-10 index of 138. He is the Editor in Chief of International Journal of Information Management Data Insights, published by Elsevier, which is a Q1 journal on data science. He has been a Guest Editor for top journals like Journal of the Association for Information Systems (ABDC A*), Decision Support Systems (ABDC A*), Industrial Marketing Management (ABDC A*), International Journal of Information Management (ABDC A*, 2 times), Information Systems Frontiers, (ABDC A, 2 times), Australasian Journal of Information Systems (ABDC A), Electronic Commerce Research (ABDC A), etc. He is also Associate Editor in Communications of the Association for Information Systems (ABDC A), Journal of Computer Information Systems (ABDC A) and Global Journal of Flexible Systems Management (ABDC A). He is on the editorial board of 12 other scientific journals.

Programme Coordinator

He has also handled over 20 externally funded research projects from national and international firms and governments like BASF (Germany), Fidelity International (UK), Department of Science and Technology (GoI), Digital India (GoI), PriceWaterhouse Coopers (UK), Facebook (NcMec/CPF, USA), EY / World Bank (Bangladesh), Ministry of Electronics and IT (GoI), CIPPEC (Argentina), Ministry of Tribal Affairs (GoI), Ministry of Textiles (GoI), World Data Science Forum (BitGrit, Japan), etc. He has also handled over 20 Training Programmes (FDPs and MDPs) within and outside India. He has given over 100 talks and keynotes in national and international conferences. He is on the research advisory board of different academic institutions like Symbiosis International University and XLRI Jamshedpur. He has been on multiple advisory and selection committees for Ministry of Cooperation, Vigyan Prasar (DST), Digital India (MeiTY), and Ministry of Education, Singapore. He has been an external expert for faculty selection in other IITs and IIMs.

He has received over 20 national and international awards from reputed organizations. He recently received the Career 360 Outstanding Faculty Award based on Research Publications and Citations from the Minister of MEITY and AICTE Chairman in October, 2023. In the past, he has received the Research Excellence Citation Award 2021 based on highest individual Web of Science citations in India based on a 5-year duration from Clarivate Analytics. He is a recipient of the Basant Kumar Birla Distinguished Researcher Award 2020 based on highest number of ABDC A* publications over a period of 5 years. His teaching case on Social Media Analytics received the Best Seller Award in IVEY Cases / Harvard Business Publishing based on 5-year sales. He has also won multiple other awards like International Federation of Information Processing Best Paper awards (3 times), Association of Computing Machinery ICEGOV Best Paper award, Tata Consultancy Services Best Researcher award, Project Management Institute Research Scholar award, Association of Indian Management Schools Best Researcher award, IIT Delhi Teaching Excellence award, multiple best paper awards from NIT conferences and Research Productivity Awards from IIM Rohtak.

In terms of education, he completed his Graduation in Engineering from Jadavpur University and Doctorate in Information Systems from XLRI Jamshedpur. Prior to joining IIT Delhi, he has worked in IIM Rohtak, Cognizant Business Consulting and IBM India Research Laboratory.

Programme Faculty

DR. SURYA PRAKASH SINGH

Dhananjaya Chair Professor and Professor

Department of Management Studies,

Indian Institute of Technology Delhi

Dr. Surya Prakash Singh is a Dhananjaya Chair Professor in the Department of Management Studies (DMS), Indian Institute of Technology Delhi (IIT Delhi), India. He is also serving as Chairperson, Operations & Supply Chain group at DMS, IIT Delhi. He holds a PhD from IIT Kanpur. He is also a postdoctoral fellow from NUS Singapore-MIT USA alliance. He has also been a visiting fellow at Newcastle Business School, Newcastle University, UK; Alborg University, Denmark; and IMT Atlantique, Nantes, France. In addition, he was also a visiting faculty at various B-Schools in the country such as IIM Amritsar, IIM Rohtak, IIM Raipur, IIM Kashipur, IIM Ranchi, MDI Gurgaon, SNU Gr. Noida, SCMHRD Pune, XLRI, and XIM Bhubaneswar.

His research interest broadly is in the decision sciences area of Operations & Supply Chain Management, Big Data Applications in Operations, Industry 4.0, Block Chain Technology, and Developing Heuristics and Metaheuristics Approaches. He has authored more than 150 research papers published in various international journals of repute which has nearly 6,000 citations and H-Index 39. He has also guest edited special issues for various journals. Recently, he has been awarded for Highest Cited Paper Award 2022 from Elsevier for having highest number of citations in web of science for his research work published in Resources, Conservation and Recycling (Impact Factor = 13.716). In addition, he is also actively involved as an Associate Editor at Global Journal of Flexible Systems Management, and Area Editor at Operations Management Research. He is also acting as Editorial Board member at International Journal of Information Management Data Insight.

Programme Faculty

As he believes in action research, therefore, he has done various projects and consultancies at domestic and international level to show the real application of the research which he carried out and published in various journals of repute. Some of the organizations where he showed application of research are UKIERI British Council Division UK; BASF SE Germany; Ministry of Tribal Affairs, Govt. of India; Rail Vikas Nagar Limited; UP Sugar Mill Associations; National Buildings Construction Corporation India; -UGC India; Central Council for Research in Ayurvedic Sciences, India; Public Health Engineering Department, Govt. of M.P.; National Highway Authority of India Limited, Govt. of India; and Ivory Education Pvt. Ltd, New Delhi.

He has also authored a text book on *Production & Operations Management* published by Vikash Publication, New Delhi, India and more than 5,000 copies have been sold.

Testimonials

It's a great course having deep curriculum on Data Science & Decision Science. You will get to know the insights on how data is important and how it can be powerful for any industry. Overall great learning experience with Arpan Sir & Surya Sir. 100% recommend.

Sudam

Nice programme what we have been attending for last one year. A very detailed & in-depth approach by the professors in clearing out the theories & concepts of data and decision science. Case Studies & projects given are very helpful in a way of application of the knowledge gained to practical problem solving.

Shubhadeep

Testimonials

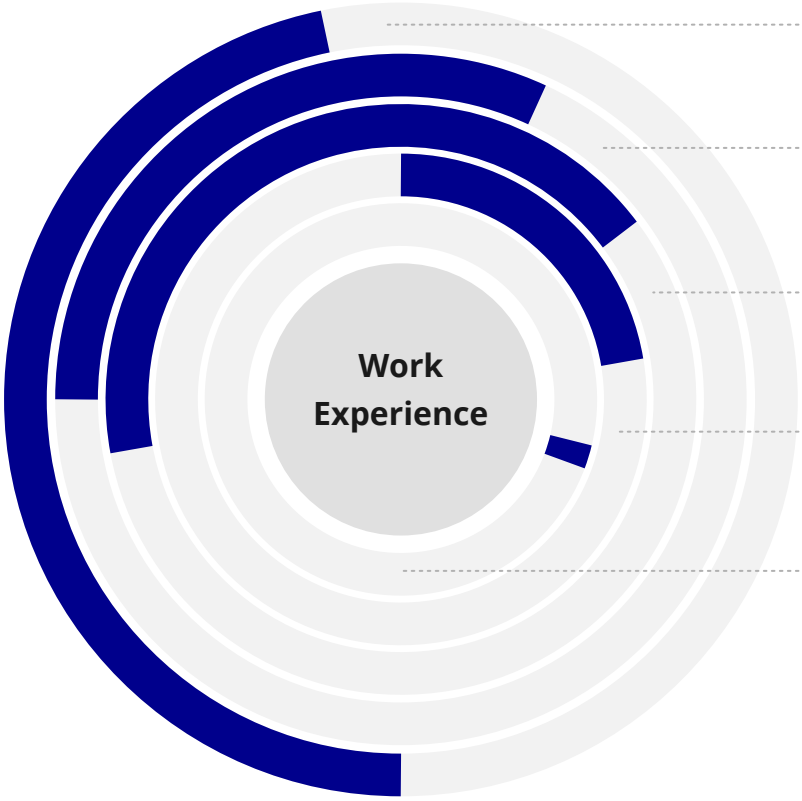
Really grateful to get this opportunity of being taught by IIT professors. Course content is also really good. Also, the introduction to tools like Orange, SPSS, LINGI, Excel Solver etc. has been a good exposure. There is no limit or boundary of learning, and all could not be covered in just one course as we all know this field of data analytics is huge. So, we need to Continuously deep dive in this ocean of knowledge and keep learning, as learning is a continuous process. Glad to have this opportunity and I have already recommended to people in contact.

Garima

Course Content is extremely well designed. Prof. presented very well, explanation with realtime case studies is very much beneficial. Will surely recommend others.

Pradeep

Past Participants Profile



- **0 to 5 yrs** 49%
- **6 to 10 yrs** 16%
- **11 to 15 yrs** 19%
- **16 to 20 yrs** 15%
- **Above 20** 1%

Industries

29%
IT Services

18%
BFSI

7%
Education

7%
Manufacturing & Supply Chain

4%
Telecom

35%
Others*

*Others includes Maritime, Aviation, Broadcast Media, Entertainment & Events, Management Consulting etc.

Programme Fee

Particulars	Amount (₹)
Programme Fees	2,05,000
GST @18%	36,900
Total Fees	2,41,900

All fees should be submitted in the IITD CEP account only, and the details will be shared post-selection.

Note:

- 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.

Instalment Schedule

Instalment	Instalment Date	Amount (₹)*
I	To be paid within 7 days of offer rollout	51,300
II	10th April, 2024	51,300
III	10th June, 2024	51,200
IV	10th August, 2024	51,200

**GST @18% will be charged extra in addition to the fee.*

Programme Timelines

Application Closure Date	8th February 2024
Programme Start Date	9th March 2024
Programme End Date	25th February 2025

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

5th in NIRF Ranking 2023 (Management Studies)	**2nd** in Outlook ICARE Rankings 2023 (Management Studies)	**2nd** in QS World University Rankings 2024 in India

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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.

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