



BUSINESS

STATISTICS

TECHNOLOGY

Post Graduate Diploma in Business Analytics

2017-19

A two year full-time residential post graduate program
offered by three pioneer institutes of India
IIM Calcutta ISI Kolkata IIT Kharagpur

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Inception of PGDBA The Industry Conclave

Globally, the demand for Data Scientists has increased exponentially over the past 5 years, exceeding its supply. In 2017, a report by IBM predicted that the rapidly evolving world of data science will result in a continued and ongoing demand for data scientists, with a 28% increase in demand by 2020.

The onus of addressing the paucity of trained workforce in the analytics domain falls to the educational institutions. IIM Calcutta, IIT Kharagpur and ISI Kolkata then decided to shoulder the responsibility of meeting the ever-increasing demand for well-rounded analytics professionals.

In order to understand the needs of the industry, a day-long conclave was held in January 2015 at IIM Calcutta, where representatives of leading companies like KPMG, EXL, Deloitte, LatentView, Tata consultancy services, Reliance communication, Deutsche Bank, Ernst and Young, State bank of India, IBM, Google, Microsoft, HSBC and Cognizant participated.

Based on the inputs provided by the companies at the conclave, ideas for a specialized course emerged. This course would create analytics leaders of the future, skilled in the essential areas of business, statistics and computer science. Through this collaboration between industry and academia, PGDBA was launched.

PGDBA is a two year full-time residential post graduate programme offered by three pioneer institutes of India - IIM Calcutta, ISI Kolkata and IIT Kharagpur. Under the able guidance of country's leading faculty, the programme aims to cater to the growing need for professionals who are well-equipped with business acumen, statistical knowledge and data analytics skills. The course nurtures future analytics leaders to improve their grasp of statistics and computer science which will help them generate key insights for real life business projects. This program is the brainchild of three institutes' vision to fulfill industry's growing demand for data driven managers and commitment for a better future. Just about 3 years old, this program has already attracted great number of students. Distinguished faculty pooled from the 3 pioneering institutes along with a 1.5% acceptance rate ensures that the best of talents are well-trained to face the challenges of Big data & Analytics driven future.

About the Course

Director's Communique



Saibal Chattopadhyay
Director, IIM Calcutta

PGDBA has been designed for students with analytical mindset and strong mathematical and problem-solving skills. The students of second batch have shown immense analytical and business aptitude in solving real time problems that plague businesses. A look at the batch profile for the present class will show that we have a good mix of both experienced and fresh graduates from leading firms and institutes with work experience in IT, Consulting, Manufacturing, Power and Financial Services.

We, along with IIMC and IIT KGP have started PGDBA to cater the growing need of professionals who are well equipped with skills required to tackle business problems. PGDBA students are selected through rigorous process of aptitude exam and interviews. The time these students spend at ISI gives them an enriching experience in statistics and I am sure that they have great potential to be successful future leaders in any organization.



Sanghamitra Bandyopadhyay
Director, ISI Kolkata



Partha Pratim Chakraborty
Director, IIT Kharagpur

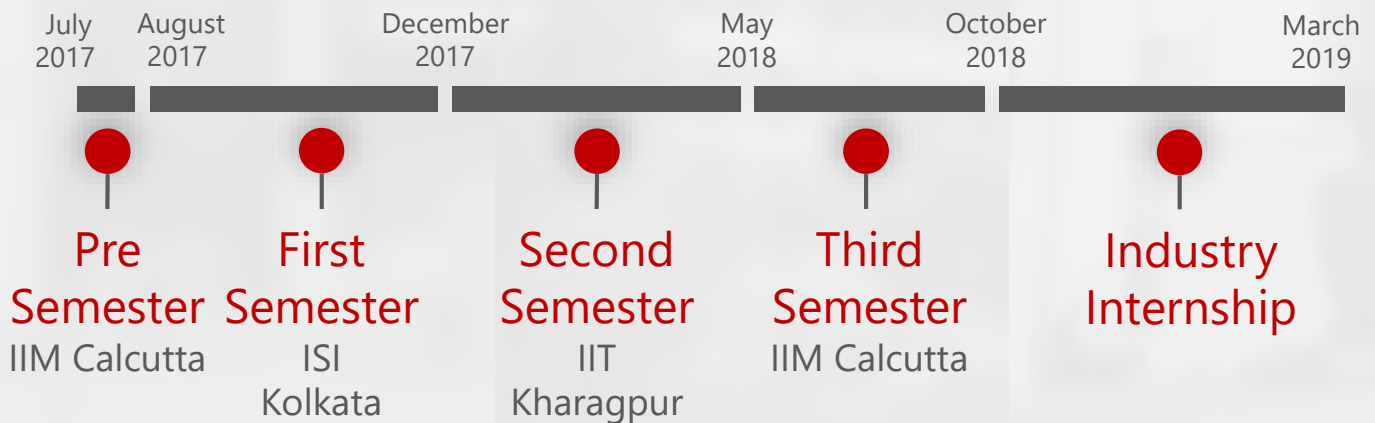
It is with immense pride that I take this opportunity to introduce you to the third batch of PGDBA. They have garnered positive responses from industry specialists that have come to campus to interact with them. Our students are also trained in management fundamentals and can take leadership roles in analytics domain. Hence I recommend them enthusiastically for your consideration. Looking forward to establish and strengthen this symbiotic relationship between your organizations and the course.

Course Structure

Unique Features

- The Pre-semester module at IIM Calcutta aims at acquainting students with fundamentals of Marketing, Finance, Organizational Behaviour and Managerial Communication. This serves as the foundation on which students build a strong analytical mindset for subsequent semesters.
- The first semester at ISI provides solid foundation in statistics, followed by the IIT semester which plays a significant role in honing the technical skills of a potential business analyst. The third semester at IIM helps to acuminate the management skills of future data scientists to enable them to take right decisions
- The final 6 months internship semester transforms the students into full-fledged industry-ready analytics professionals, by providing a platform to apply the unique blend of skills acquired by them to real world applications of business analytics

Timeline



Academic Structure

Business

Business acumen is necessary at every stage of an analytics project. Starting from asking the right questions to understanding the implications and coming up with strategies based on meticulous analysis. Students of PGDBA have been nurtured to use their grasp of statistics and computing to generate key insights for business.

Courses

- Financial Risk Management
- Business Economics
- Strategic Management
- Marketing Management
- Organizational Behavior
- Managerial Communications
- Pricing & Revenue Optimization
- High Frequency Trading & News Analytics
- Computational Finance
- Modelling in Operations Management
- Supply Chain Analytics
- Business Accounting & Banking Analytics
- Healthcare Analytics
- Product Analytics

Statistics

Statistics is the plinth on which the very analytics project rests. Statistical inference techniques are required to understand the data at hand and statistical modelling forms the basis of all machine learning techniques. PGDBA students have been trained by prominent faculty to set the right foundation for analytics knowledge.

Courses

- Probability and Stochastic processes
- Statistical Inference
- Multivariate Analysis
- Statistical Structures in Data
- Linear Regression
- Time Series Modelling
- Linear Algebra
- Econometric Methods
- Advanced Predictive Modelling
- Analytics in Business Forecasting
- Categorical Data Analysis

Technology

Big Data technologies have evolved by leaps and bounds in past decade and with it the deluge of data has made it challenging for firms to grapple with sheer volume, velocity, dimensionality and variety of data. PGDBA students have gained skills for algorithmic thinking and have been rigorously trained in machine learning applications and theory.

Courses

- Algorithm Design & Analysis
- Data Structures
- Machine Learning
- Deep Learning
- Data Science Laboratory
- Computing for Data Science
- Database Management Systems
- Hadoop MapReduce
- Information Retrieval
- Complex Networks
- Cloud computing
- Business Data Mining

Faculty Speaks



Debapriyo Majumdar

Assistant Professor
ISI Kolkata

I was amazed by students' strong motivated attitude towards learning and applying their knowledge. Apart from excelling in theory, their performance in course projects convinced me that the class is very passionate and enthusiastic about data analytics.

It was refreshing to find a group of young talented minds eager to work on real-life problems day-in and day-out, and still retain the zeal to look beyond the problem and aspire for ingenuity. The students drove themselves harder each day to master the intricate details of applied statistics and theoretical computing with the eventual goal of understanding the fundamentals of Data Science. They formulated nontrivial data-dependent problems, produced computation-intensive machine learning solutions, and delivered polished data-driven presentations throughout the program. The energy that the students still possess after a rigorous three-semester ordeal at ISI-IIT-IIM proves that they are ready to enter the world of Business Analytics to make a change!



Saurav Sen Gupta

Lecturer, School of Computer
Science and Engineering
Nanyang Technological
University, Singapore



Ritu Mehta

Associate Professor
Marketing, IIM Calcutta

PGDBA is one of the most rigorous experiments in the country in recent times to serve the managerial talent in the rapidly emerging field of data-driven business insights and solutions. My sessions in Marketing Management were a rewarding experience for me. The participants were able to provide rich perspectives with in-depth analysis to the business problems.

Faculty Speaks



Manju Jaiswall

Associate Professor
Finance and Control, IIM Calcutta

The Business Analytics course is very meticulously designed identifying the industry need for the requisite skill set. It was a pleasure interacting with the third batch of students during my course. I could feel the class composition having significantly changed over successive batches, in favor of more informed students who could differentiate between managerial roles and data scientists. The students were very focused, intuitive and driven with a willingness to work hard. With the growing need for managerial talent in the field of Business Analytics I am hopeful they would do wonders.

I had a great time taking the Data Science Lab Course for the PGDBA students. I found them bright, inquisitive and hard working. They showed keen interest in the subject and asked non-trivial questions. I believe these boys and girls are one of the best in Asia in Analytics field.



Sujoy Bhattacharya

Associate Professor
Vinod Gupta School of Management
IIT Kharagpur



Animesh Mukherjee

Associate Professor
Dept. of Computer Science and
Engineering, IIT Kharagpur

I sincerely appreciate the passion showed by the PGDBA students in learning the subject that I was teaching them this time. Almost every day they would flock around me after the class with questions, clarifications and how what I have taught can be further enhanced. I am quite impressed by their dedication and diligence



Internship & Final Placement Report

Industry Internships

The 6 month internship program is one of the unique aspects about PGDBA because :

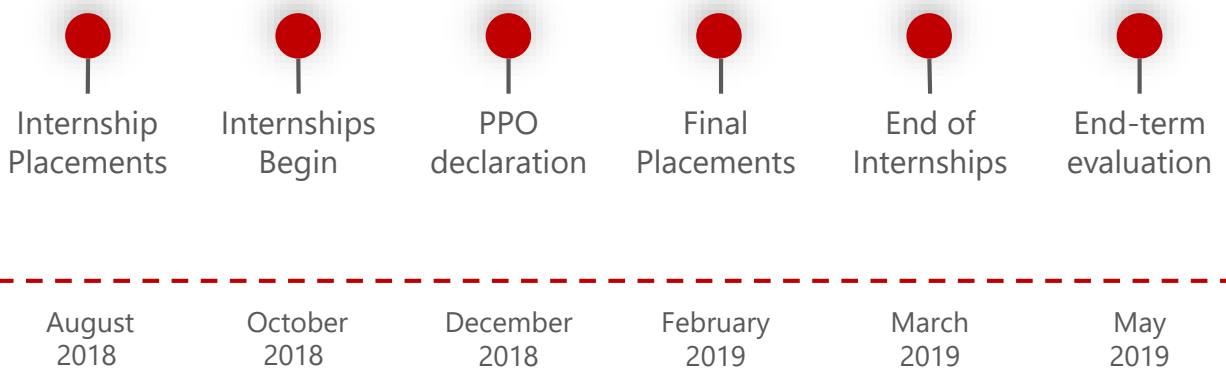
- It happens after students have completed their course curriculum
- The longer duration helps students transform into industry-ready professionals
- There would be no time lag between internship and full time joining in case of a PPO

After spending three rigorous semesters, the PGDBA internship experience helps students to apply their statistics, machine learning and business principles to real-world problems and add significant value to the firms they work with. Thus, the internship becomes a crucial part in the course structure.

Salient features of the internship

- The 6 month internship is the longest compared to the summer internships at other post graduate programs. Students can take up challenging problems and carry out the projects to fruition
- It gives the companies an adequate amount of time to accurately gauge the capabilities of the student
- As it is positioned towards the end of the course, the transition from an intern to a full-time-employee becomes easy, if a PPO is offered and accepted. As a result 71% of the PGDBA 2016-18 batch were offered a PPO
- Most of the students who accepted the PPO even continued to extend the projects they worked on as interns
- Each student is assigned a professor from one of the institutes as an academic mentor and the reporting manager at the interning company becomes the Industry mentor.
- The internship carries 15% of total course credits and is closely monitored by both academic and industry mentors

Tentative Timeline

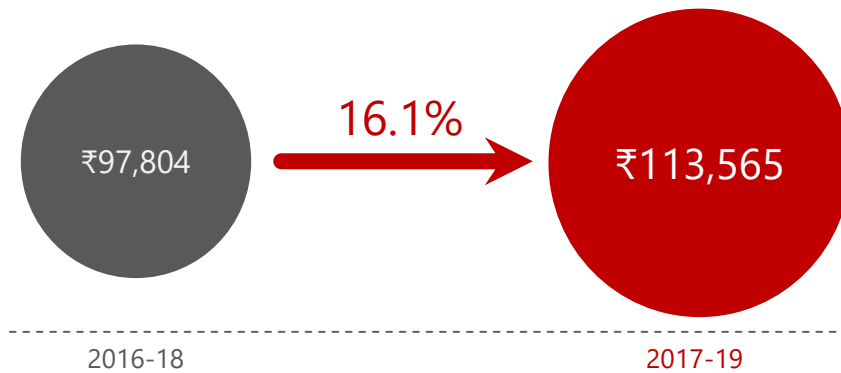


Internship Statistics

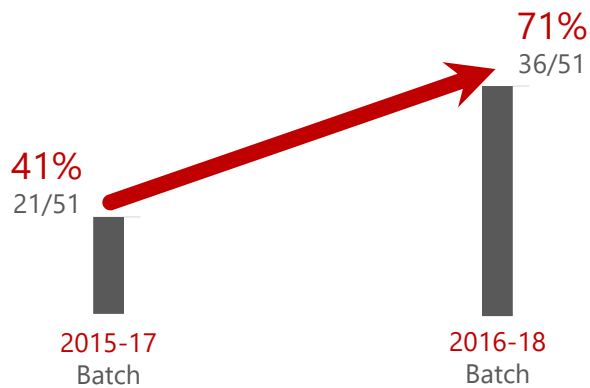
Stipend Offered – 2017-19

Monthly Stipend	
Average	INR 113,565
Median	INR 111,000
Highest	INR 140,000

Increase in average stipend offered



PPOs Offered

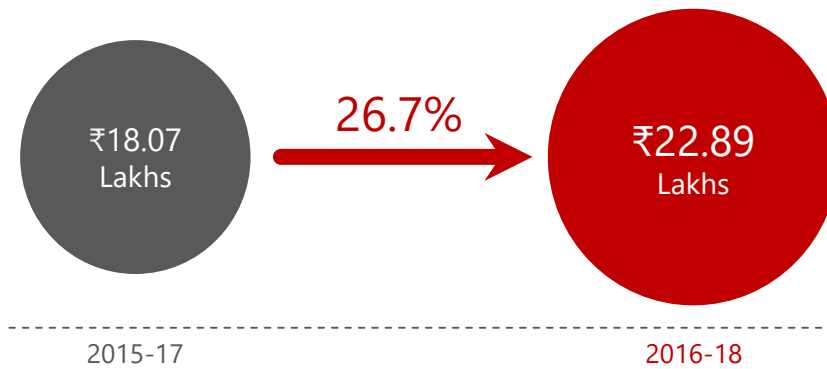


Placement Statistics

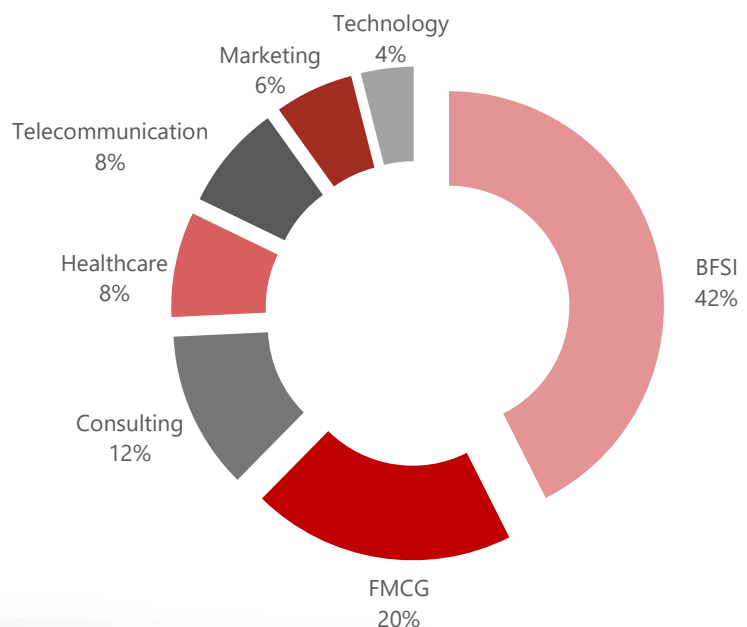
Compensation Offered – 2016-18

CTC	Domestic	Domestic + International
Average	INR 21.94 Lakhs	INR 22.89 Lakhs
Median	INR 21.05 Lakhs	INR 21.36 Lakhs
Highest	INR 41.4 Lakhs	INR 47.02 Lakhs

Increase in average package offered



Sector-wise Split of Final Accepted Offers



Our Past Recruiters



Batch Statistics



52
Batch Size



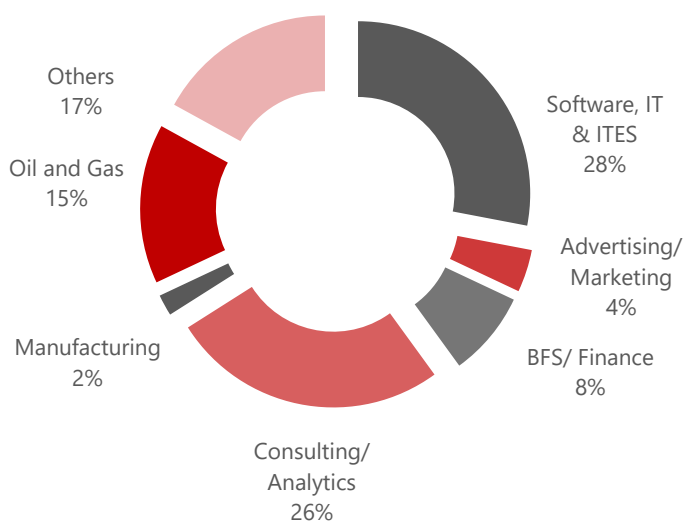
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Female Students



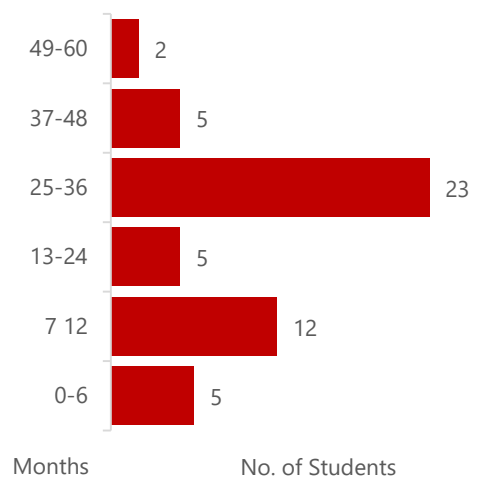
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Average Work Experience
(In Months)

The batch of PGDBA 2017-19 has a strong academic background with **64%** of the batch being graduates / post-graduates from **Tier-1 Institutes** (IIMs, IITs, NITs, BITS)

Academic Background



Work Experience



Select Analytics Projects

BFSI

- Modeling volatility and price prediction of cryptocurrencies
- Portfolio Selection using Deep learning (Deep Portfolio Theory)
- Pair Trading through Cointegration And Hidden Markov Models
- Options pricing using Reinforcement Learning
- "Time-series modeling of Conditional Returns, Volatility and Correlations of Indian stocks and portfolio optimization"
- Detecting fraudulent transactions
- Performance Analysis & Portfolio Recommendation of Retail ventures through Financial Statements Analysis

Techniques Used:

Random Forest, Auto-encoders, Elastic net, Recurrent Reinforcement Network, HMM, XGBoost, ARIMA, GARCH, Topic Modeling

Social Media & Network Theory

- Understanding Social Movement in Twitter: #BlackLivesMatter vs #WhiteLivesMatter
- Identification of duplicate question pairs on Quora
- Detecting dynamic communities in Time-Varying network
- Node Embedding for Heterogeneous Graphs
- Detecting Multiple K-cores in a Network using Spectral Clustering
- Building and applying a knowledge graph for the Legal Domain

Techniques Used:

LSTM, NLP, Topic Modelling, Graph Theory, Community Detection

Language Models (NLP)

- Stock price prediction Using Twitter Sentiment Analysis
- Yelp fake review detection
- Amazon product review to ratings prediction
- Learning Entity Representation for Entity Disambiguation
- Predicting drunk texting in Twitter using Deep Learning Models
- Toxic Comment Classification Challenge

Techniques Used:

Word Embeddings, Factorization Machines, LSTM, Autoencoders Stacking, Community Detection

Image

- Real-time face to name tagging of set of people on a webcam
- iMaterialist Challenge-Image Classification of furniture goods
- Captcha Recognition - Breaking Captcha on the Fly
- Carvana Image Masking Challenge

Techniques Used:

CNN, Transfer Learning, ResNet, InceptionNet, VGG16

Select Analytics Projects

Healthcare

- Find the nuclei in divergent images to advance medical discovery
- Identification of class of thorax diseases from the given chest x-ray images
- Predicting dengue disease spread using time series analysis
- Predicting lung abnormalities from x-ray images using transfer learning

Techniques Used:

Transfer Learning, ResNet, InceptionNet, DenseNet, Unet, Mask RCNN, SVR, ARIMA

Production & Sales Forecasting

- Predicting product Back Orders
- Predicting the quantity returned by the customer to the retailer
- Predicting demand at each store/dept. of retail business
- Demand Prediction and Automated Employee Scheduling
- Short-term Electric Load and Availability Forecasting
- Wind Power Forecasting using Deep Learning

Techniques Used:

ARIMA, Sequence LSTMs, kNN Regression, SVR, Linear Programming

Recommender Systems

- KKBox Music Recommendation
- Recommendation of products based on click data on e-commerce website
- Cross-selling financial products to trading customers
- Predicting up-sell propensity of insurance customers & recommend best suited plan
- Instacart Market Basket Analysis

Techniques Used:

Factorization Machines, FFM, Apriori, XGBoost, LightGBM, SVD, Random Forest, Collaborative Filtering, Stacking

Others

- Spatio-temporal prediction of link travel times.
- Detecting WannaCry Ransomware with time series analysis
- From AO to AI: Predicting How Points End in Tennis
- Predicting Real Estate Price in Chennai

Techniques Used:

LSTM, Auto Encoders, Random Forest, Stacking, LightGBM

Student Life

PGDBA offers its students a unique blend of experiences of staying at three diverse campuses, each adding its own unique flavor to the mix. For starters, strolling around campus on a fine evening might seem a good idea to explore the 30 acres of ISI and the 135 acres of IIM, but to unravel the limitless 2,100 acres of IIT you'll either need a bike or a tremendous will.

Life at IIM



At IIM Calcutta campus, popularly known as Joka amongst the residents, PGDBA students are part of the institute's sports team and have won laurels while participating in two inter IIM events. Students gave a good account of themselves in the inter-session sports meet with few winning the coveted Emerging Player of the Year award fending off competition from students of all courses. The campus has extensive sport facilities including a fully equipped kayaking setup. The lush green, picturesque campus adorned with seven lakes and a miniature Howrah bridge, serves as a perfect muse for the photography enthusiasts amongst the batch.

Life at IIT

The second semester at IIT KGP was quite a contrast in terms of scale and magnitude of every event as compared to ISI. Students had the opportunity to attend the renowned technical and cultural festivals of KGP – Kshitij and Spring Fest respectively. Students took part in the management festival organized by VGSOM and emerged victorious in a couple of events. VGSOM also celebrated its 25th anniversary where students had the unique opportunity to interact with Vinod Gupta, the man who lends his name and legacy to the management school. Students represented their hostels in different inter-hall sports events, bagging gold in a few. All in all life at IIT is replete with cultural, sporting, technical and academic events giving a panoramic experience to the students.



Life at ISI

Our stay at ISI coincided with the 125th birth anniversary of the visionary founder of ISI, Prof. PC Mahalanobis. The year-long celebration was inaugurated by the then Hon'ble President of India, Shri Pranab Mukherjee and was followed by a series of conferences and lectures delivered by distinguished faculty from all around the globe, including a Nobel Laureate. The badminton court which also tripled up as a futsal and cricket court was a refuge for students, sheltering them from the academic rigors and giving them a new lease of life to meet all the demands of such an exacting course. Students also engaged in photography, capturing the quaint beauty of the sprawling campus of ISI. Vir Sanghvi has famously said that, "You can take the craze of Diwali in Delhi, Christmas in London, summer carnival in Rio and then add it to the month long madness of the WC and cram all that into a span of 5 days, you still wouldn't know what you're missing if you haven't been in Kolkata during Durga Puja" and students get a chance to experience the grandeur firsthand whilst in ISI.



Chairperson's Desk



Sahadeb Sarkar

Professor
Operations Management Group,
IIM Calcutta

Professor Sahadeb Sarkar completed B.Stat followed by M.Stat from Indian Statistical Institute Kolkata and went on to pursue Ph.D in Department of Statistics, Iowa State University. He has held various positions as a part of Academic Administration, IIM Calcutta in the past. He is now supervising the PGDBA program as the chairperson.

Professor Prabina Rajib joined IIT in 2000 after completing Ph.D from IIT Kharagpur. With vast teaching experience and responsibility of VGSOM – IIT Kharagpur as acting dean, she has also taken charge of PGDBA program for IIT.



Prabina Rajib

Professor & Acting Head
VGSOM IIT Kharagpur



Biswabrata Pradhan

Associate Professor
SQC and OR Unit, ISI Kolkata

An excellent research faculty at ISI Kolkata, professor Biswabrata completed B.Sc (Hons) followed by M.Sc in Statistics from University of Calcutta. He then completed M.Tech in Quality, Reliability and Operations Research from ISI and PhD in Statistics from ISI in 2010.

Placement Faculty Coordinators

Arun Kumar Misra

Associate Professor, VGSOM, IIT Kharagpur

Abhishek Goel

Associate Professor, Organizational Behavior Group , IIM Calcutta

Debapriyo Majumdar

Assistant Professor, ISI Kolkata

Student Placement Representatives

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Course	Faculty	Credentials
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Pre- Semester (IIM Calcutta)

Organizational Behavior	Prof. Abhishek Goel	Fellow (IIM Ahmedabad), MBA (FMSR, AMU)
Marketing Management	Prof. Ritu Mehta	Ph.D. (IIT Kanpur)
Contemporary Business Analytics	Prof. Indranil Bose	M.S. & Ph.D. (Purdue University)
Financial Reporting and Analysis	Prof. Manju Jaiswal	IFPM - Ph.D. (IIM Bangalore)
Managerial Communication	Ms. Apoorva Bhardwaj Pragyan Rath	Ph.D. (American Literature) Ph.D. (English) - Humanities and Social Sciences (HSS) Department (IIT Bombay)

1st Semester (ISI Kolkata)

Statistical Structures in Data	Debasis Sengupta	Visiting Professor, Department of Statistics (University of California)
Computing for Data Sciences	Sourav Sengupta	Ph.D. (ISI Kolkata), M.S. (University of Waterloo)
Stochastic Processes and Applications	Prof. Krishnendu Mukhopadhyaya	Ph.D, M.Tech & M.S. (ISI Kolkata)
Inference	Amitava Bandyopadhyay	Sr. Technical Officer (SQC), SQC & OR Unit, ISI Kolkata
Fundamentals of Database Systems	Prof. Debapriyo Majumdar	Research Scientist (IBM Bangalore), Ph.D.(Max-Planck-Inst. of Informatics, Saarbrucken)

2nd Semester (IIT Kharagpur)

Modelling in Operations Management	Dr Amit Upadhayaya	Ph.D. (IIT Delhi)
Data Science Laboratory	Prof Sujoy Bhattacharya	Ph.D. (IIITM Gwalior)
Foundations of Algorithm Design and Machine Learning	Prof Sourangshu Bhattacharya	PhD Computer Science, Indian Institute of Science, Bangalore.
Regression and Time Series Models	Dr. Buddhananda Banerjee	Ph.D. ISI Kolkata
Product Analytics	Prof. Pranab Kumar Dan	Ph.D. (Jadavpur University)
Venture Analytics	Prof Prabha. Bhol	Ph.D. (IIT Kharagpur)
Supply Chain Analytics	Prof. Kunal K Ghosh	Ph.D. (IIT Kharagpur)
Complex Network	Prof.Bivas Mitra	Ph.D. (IIT Kharagpur)
Information Retrieval	Prof. Pawan Goyal Prof. Animesh Mukherjee	Post doctoral fellow (INRIA Paris-Rocquencourt), Ph.D. (IIT Kharagpur)

3rd Semester (IIM Calcutta)

Categorical Data Analysis	Prof. Sahadeb Sarkar	Ph.D.: Department of Statistics, Iowa State University, M.Stat (ISI Kolkata)
Business Economics	Prof Runa Sarkar	Fellow (IIM Calcutta), Master of Science in Environmental Engineering, University of North Carolina
Strategic Management	Prof. Ramya Venkateswaran	Fellow (IIM Bangalore), PGDM (IIM Bangalore)
Business Data Mining	Mr. Ramasubramanian Sundararajan	Head, AI Lab (Cartesian Consulting)
Project Management	Prof. Bodhibrata Nag Mr. Saikat Dutt	Fellow (PhD), Operations Research & Systems Analysis, IIM Calcutta Director, Cognizant Technology Solutions
Human Resource Management	Prof. Debashish Bhattacharjee	Ph.D. & M.A. (University of Illinois Urbana-Champaign)
Selected Aspects of Predictive Modelling	Prof. Manisha Chakrabarty	Ph.D. (ISI Kolkata)
Corporate Finance	Prof. B B Chakrabarti	Ph.D. (University of British Columbia, Canada)
Computational Finance	Prof .Vivek Rajvanshi	Fellow (IIM Calcutta), M.Sc. (Statistics)
Decisions and Games	Prof. Conan Mukherjee	Ph.D. Quantitative Economics (Indian Statistical Institute)
Games and Information	Prof. Arijit Sen	Ph.D. (Economics), Princeton University
Econometrics Methods with Applications in Business and Economics	Prof. Manisha Chakrabarty	Ph.D. (ISI Kolkata)
Pricing and Revenue Optimization	Prof. Preetam Basu Prof. Sumanta Basu	Ph.D. (University of Connecticut) FPM in Production and Quantitative Methods, (IIM Ahmedabad)



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