



An Autonomous Institution of Government of Kerala



The Kerala State Higher Education Council

Constituted by Kerala State Legislature by notification No. 19536/Leg. U-I/3/2007/Law Dated, Thiruvananthapuram, 15 October, 2007

കേരള സംസ്ഥാന ഉന്നതവിദ്യാഭ്യാസ കൗൺസിൽ

# GULATI INSTITUTE OF FINANCE AND TAXATION IN COLLABORATION WITH KERALA STATE HIGHER EDUCATION COUNCIL PRESENTS

## RESEARCH CAPACITY BUILDING PROGRAM (RCBP) DATA ANALYTICS USING PYTHON

Three - Month Certificate Program (Online)  
November 2025 to January 2026



## Contents

1. About KSHEC and GIFT
2. About RCBP
3. Duration
4. Eligibility and Admission
5. Course Fee
6. Course Syllabus
7. Logistical Support
8. Attendance, Assignments, and Certificate
9. Mentoring Team
10. Contact



## ► About KSHEC and GIFT:

Kerala State Higher Education Council (KSHEC) is an apex-level statutory body that strives to bring about excellence and equity in the higher education sector in the state. Towards this end, the Council is engaged in, among others, rendering advice to the government; coordinating the role of the government, universities, as well as apex regulatory agencies; formulating and initiating new concepts, programs and replicable models; providing common facilities without impinging upon the autonomy of the higher education institutions.

Gulati Institute of Finance and Taxation (GIFT) envisages promoting theoretically grounded and empirically-based research within an interdisciplinary perspective to aid national and sub-national-level policymaking. Recognized by the Indian Council of Social Science Research (ICSSR), GIFT offers a Ph.D. program in social science, backed by a rigorous coursework, which is affiliated with Cochin University of Science and Technology (CUSAT). Apart from being a highly acclaimed institute undertaking training programs for capacity building of different stakeholders, including Government officials, GIFT offers a Post Graduate Diploma in Goods and Service Taxation (PGD-GST). The governance of the institute is entrusted to a Governing Body and an Executive Committee consisting of scholars of eminence and senior administrators representing the Central and State Governments. The Finance Minister of the Government of Kerala is the Chairperson of the institute.

GIFT in collaboration with the KSHEC is delighted to announce the 6th edition, of the RCBP for the 2025-26 period. This edition envisages a unique program providing a hands-on, beginner-friendly initiative aimed at helping researchers and practitioners feel more confident working with data. Designed especially for those from non-technical backgrounds, the program introduces participants to the Python environment in a clear and accessible way. The program will help understanding the basics of data cleaning, organizing messy datasets, and using simple yet powerful tools to explore patterns and relationships. Participants will learn how to use Python libraries like Pandas and Matplotlib to make sense of real-world data. It also covers key statistical techniques, and regression analysis, with a focus on interpretation and application. The goal is not just to teach coding, but to help participants build a practical and intuitive understanding of the rich high frequency data of the digital world of today to support meaningful research. No prior programming experience is needed, and the sessions are paced to support different learning styles. By the end of the program, participants will be equipped with a set of tools and workflows they can apply in their own research and profession.



## ▶ About RCBP

GIFT initiated the Research Capacity Building Program (RCBP) in 2020-21 to facilitate an interactive learning platform for the research capacity building of Scholars. Conceived as a program that goes beyond conventional research methodology programs, this edition focuses on enabling the participants to get familiarised with the Python environment and data analysis. As this skill is much sought after not only in academics now but also in industry and corporates. The program is designed to benefit different categories, including students, research scholars, faculty members, government officials, and practitioners from different domains. Hitherto, the feedback received from heterogeneous participants has been overwhelming

### RCBP: Programme Structure

This three-month online program is thoughtfully designed to accommodate both students and working professionals, offering a flexible and accessible learning experience. ***Classes will be held three times a week, each session lasting two hours, and scheduled outside regular office hours to ensure participants can engage without disrupting their daily commitments.*** The structure balances guided instruction with hands-on practice, allowing learners to gradually build confidence in using Python for data analytics. ***To further support participants, dedicated faculty-aided doubt-clearing and interactive learning sessions will be organized on selected weekends, creating space for deeper discussion, troubleshooting, and personalized guidance.*** The structure of the Program is detailed in the table below:



## RCBP 2025-26: Programme Structure

| Module          | Content  | Number of Hours |
|-----------------|--|-----------------|
| <b>Module 1</b> | <b>Programming Foundations with Python: Familiarising with the Python environment, working with different data types and variables</b>   | <b>16</b>       |
| <b>Module 2</b> | <b>Data Libraries, Statistical Analysis &amp; Visualization: Descriptive Statistics, Fundamentals of Probability, Correlation and Regression Analysis, Infographics for statistical data and advanced plots</b>  | <b>18</b>       |
| <b>Module 3</b> | <b>Business Intelligence &amp; Statistical Inference: Sampling theory, Hypothesis testing, and ANOVA</b>   | <b>14</b>       |
| <b>Module 4</b> | <b>Supervised &amp; Unsupervised Machine Learning and Application of Statistical Analysis: Advanced statistical analysis with machine learning, Limited Dependent Variable cases, Decision Tree, Random Forest, Clustering, and Principal Component Analysis</b> | <b>18</b>       |
| <b>Module 5</b> | <b>Deep Learning Overview &amp; Capstone Project: Application of learnings and make a project of your own</b>  | <b>6</b>        |

*\*Total hours: 72. There will be additional sessions to facilitate faculty-guided interactive learning on dedicated weekends for personalized guidance*

**\*The course is scheduled to commence on 3<sup>rd</sup> November 2025**



## ► Eligibility and Admission

### Who can apply:

- Scholars currently enrolled in Ph.D. programs in any discipline
- Academicians, Government officials, and other working professionals
- Undergraduate degree students in their final year and ongoing Master's Degree program students

*There is no age limit for joining the course.*

### How to apply:

Interested candidates may submit their google form along with enclosures and pay the prescribed fee through the payment gateway specified in the Google form. For the Google form, follow the RCBP link on the GIFT website <https://www.gift.res.in/rcbp/>, or visit the following link : <https://forms.gle/9RFE7oHkoNbJrpQ27>

#### Enclosures in the Google form:

1. Enclose a self-attested copy of the Student ID card/ Degree Certificate. Enclose a letter from the head of the department endorsing your eligibility as a student to attend the program.
2. Enclose a copy of your identity proof (PAN/AADHAR/ VOTER ID/PASSPORT)
3. For academicians, Government officials, and other working professionals, enclose the Employee ID
4. Enclose a copy of the proof of payment.

***The last date for submitting the filled-in application form and the Fee Receipt is 12<sup>th</sup> October 2025.***

Admission to the RCBP program will be based on duly submitting the application form and the course fee.



## ▶ Course Fee

| Category                   | Course Fee          |
|----------------------------|---------------------|
| Students/FuHTime Scholars  | ₹7,000/- + 18% GST  |
| Faculty Members and Others | ₹10,000/- + 18% GST |

### *Refund of Fee:*

Fees, once paid, will not be refunded. However, if the institute rejects the application, the fees remitted will be refunded after deducting administrative charges as decided by the institute.

**Communication to Participants:** All communications to the participants regarding admission, dates, and assignment submissions will be communicated through email and google classroom.

## ▶ Course Syllabus

### Data Analytics Using Python

**Course Objectives:** This course provides a practical foundation in data analytics using Python, guiding learners from environment setup and basic programming concepts to advanced analytical techniques. The curriculum covers essential statistical concepts such as descriptive analysis, fundamentals of probability, correlation and regression analysis, advanced business intelligence, and statistical inference. It also covers Limited Dependent Variable cases, decision trees, random forests, clustering and Principal Component Analysis (PCA). Learners will create informative visualizations and design dashboards using Power BI. The course also introduces hypothesis testing, ANOVA, and machine learning workflows, including linear models, classifiers, decision trees, ensemble methods, clustering, and dimensionality reduction. Finally, a capstone project encourages reflection and integration of skills for real-world application.



## Module 1: Programming Foundations with Python (Sessions 1 – 8)

Session 1 – Python setup & introduction: Install and configure a Python environment (Anaconda or Colab) and run a first notebook (“Hello World”) while becoming familiar with the notebook interface. Session 2 – Variables, data types & operators: Work with core Python data types (int, float, string, bool) and basic operators; practice type conversion and expressions. Session 3 – Lists & tuples: Create, index, slice, and manipulate lists and tuples for ordered data storage and retrieval. Session 4 – Sets & dictionaries: Use sets for membership and deduplication; use dictionaries for key–value storage and lookup. Session 5 – Conditional logic: Implement decision-making with if / elif / else and conditional expressions. Session 6 – Loops: Iterate with for and while loops; control flow with break and continue. Session 7 – Functions: Define and use functions to write modular, reusable code for data-processing tasks. Session 8 – Error handling & debugging: Handle exceptions with try / except and practice debugging techniques on hands-on problems.

## Module 2: Data Libraries, Statistical Analysis & Visualization (Sessions 9 – 17)

Session 9 – NumPy essentials: Create and manipulate NumPy arrays; perform vectorized numerical operations. Session 10 – Pandas essentials: Load and inspect tabular data (CSV); use head(), info(), describe() and basic DataFrame operations. Session 11 – Introduction to statistics & probability: Overview of descriptive statistics and basic probability concepts for data analysis. Session 12 – Probability fundamentals and distributions: Define sample space and events; understand PDFs and CDFs and their applications. Session 13 – Descriptive statistics & outlier detection: Compute central tendency and dispersion; identify and understand outliers using code and plots. Session 14 – Correlation & regression analysis: Measure relationships between variables and build simple regression models; use scipy / statsmodels for computation. Session 15 – Matplotlib basics: Create static plots for data presentation — bar, line, and scatter charts. Session 16 – Seaborn statistical plots: Produce informative statistical visualizations such as boxplots, violin plots, and pairplots. Session 17 – Grouping, aggregation & cleaning: Summarize data with groupby() and aggregation functions; handle missing values and perform outlier treatment.



## Module 3: Business Intelligence & Statistical Inference (Sessions 18 – 24)

Session 18 – Power BI — Connecting data: Import external data sources (CSV, Excel) into Power BI and prepare data for analysis. Session 19 – Power BI — Report building: Design interactive reports and dashboards; create standard charts (bar, pie, line) and layout visuals. Session 20 – Sampling methods: Understand and apply common sampling techniques (random, stratified) and their practical uses. Session 21 – Sampling theory & estimation: Cover sampling distributions, relationships between sample statistics and population parameters, and types of sampling. Session 22 – Hypothesis testing I — t-test & chi-square: Formulate and execute t-tests and chi-square tests; interpret results and p-values. Session 23 – Hypothesis testing II — ANOVA: Conduct one-way ANOVA to compare group means and interpret output in Excel or Python. Session 24 – Nonparametric hypothesis testing: Apply rank-based and other nonparametric tests when parametric assumptions are not met.

## Module 4: Supervised & Unsupervised Machine Learning and Application of Statistical Analysis (Sessions 25 – 33)

Session 25 – Machine learning concepts overview: Review ML workflow, supervised vs. unsupervised learning, and real-world case studies. Session 26 – Linear regression: Build, interpret, and validate linear regression models using scikit-learn. Session 27 – Classification — Logistic regression: Train and evaluate binary classifiers using logistic regression; examine confusion matrices. Session 28 – Model evaluation techniques: Assess model performance with metrics (accuracy, precision, recall, F1) and ROC analysis. Session 29 – Decision trees & ensemble methods (bagging, random forest): Train decision trees and random forests; compare performance and robustness. Session 30 – Boosting algorithms: Implement and evaluate boosting methods (e.g., XGBoost, AdaBoost) for improved predictive power. Session 31 – SVM & K-Nearest Neighbors: Apply Support Vector Machines and K-Nearest Neighbors classifiers and interpret results. Session 32 – Clustering: Use K-Means and hierarchical clustering to segment data; visualize cluster structures. Session 33 – Principal Component Analysis (PCA): Apply PCA for dimensionality reduction and visualize principal components.



## Module 5: Deep Learning Overview & Capstone Project (Sessions 34 – 36)

Session 34 – Overview of deep learning: High-level introduction to deep learning concepts, architectures, and typical use cases (no implementation required). Session 35 – Capstone — topic selection: Select and plan a capstone project; define objectives, data sources, and methodology. Session 36 – Capstone & course wrap-up: Present capstone projects, reflect on learning outcomes, and discuss next steps in study or practice.

### General Reading List

- Baltagi, B. H. (2013). *Econometric analysis of panel data* (5th ed.). Wiley.
- Bishop, C. M. (2006). *Pattern recognition and machine learning*. Springer.
- Bruce, P., & Bruce, A. (2017). *Practical statistics for data scientists: 50 essential concepts*. O'Reilly Media.
- Chollet, F. (2017). *Deep learning with Python*. Manning Publications.
- Géron, A. (2019). *Hands-on machine learning with scikit-learn, Keras, and TensorFlow*. O'Reilly Media.
- Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep learning*. MIT Press.
- Gujarati, D. N., & Porter, D. C. (2009). *Basic econometrics*. McGraw-Hill/Irwin.
- Healy, K. (2018). *Data visualization: A practical introduction*. Princeton University Press.
- James, G., Witten, D., Hastie, T., & Tibshirani, R. (2013). *An introduction to statistical learning: With applications in R*. Springer.
- Johnston, J., & DiNardo, J. (1997). *Econometric methods* (4th ed.). McGraw-Hill.
- Lipschutz, S., & Schiller, J. (2013). *Introduction to probability and statistics (Schaum's Outline)*. McGraw-Hill.
- McKinney, W. (2017). *Python for data analysis*. O'Reilly Media.
- Moore, D. S., McCabe, G. P., & Craig, B. A. (2017). *Introduction to the practice of statistics*. W. H. Freeman.
- Provost, F., & Fawcett, T. (2013). *Data science for business: What you need to know about data mining and data-analytic thinking*. O'Reilly Media.
- Ramalho, L. (2015). *Fluent Python*. O'Reilly Media.
- Raviv, G. (2018). *Collect, combine, and transform data using Power Query in Excel and Power BI*. Apress.
- Sweigart, A. (2019). *Automate the boring stuff with Python*. No Starch Press.



## ► Attendance, Assignments, and Certificate

The students should maintain 75% attendance and submit the required assignments to get the course certificate.

## ► Specialized Resource Persons

**Dr. Bindu Krishnan** is a Senior Data Scientist, Data & AI, IBM India Software Labs, Kochi, Kerala. She holds a Doctorate holder in Statistics with more than 20 years of experience in academics and research. Prior to this, she had served as the Professor & Head of Department of Data Science, CS & IT, Jain University, Kochi, Kerala and as Associate Professor and Assistant Professor in various institutions. She holds Certifications in the area of Data Science and Artificial Intelligence, including Certifications on 'Data Processing using R' and 'Machine Learning using Python' from Indian Statistical Institute, Bangalore.

**Mr. Vimal D Kumar** is a Research Associate at the Centre for Digital Transformation and Innovation, Digital University Kerala. Specializing in data analytics and visualization, he brings extensive expertise to his field. He spearheads sessions on data visualization, skilfully guiding participants through the use of appropriate software tools.

## ► GIFT Mentoring Team:

Prof. K J Joseph, Director, GIFT

Dr. Saraf A, Registrar, GIFT

Dr. Anoop S Kumar, Assistant Professor, GIFT

Dr. Kiran Kumar Kakarlapudi, Assistant Professor, GIFT

Dr. Renjith PS, Assistant Professor, GIFT

Dr. Aswathy Rachel Varughese, Assistant Professor, GIFT



## Contact

### The Co-ordinators [RCBP]

*Dr. Akhil M P, Assistant Professor, GIFT*

*Dr. Aswathy Rachel Varughese, Assistant Professor, GIFT*

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## GIFT TEAM

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**Dr. Saraf A, Registrar, GIFT**

**Smt. Jenny Thekkekara, Associate Professor**

**Dr. U.P Anilkumar, Assistant Professor**

**Dr. Meenu Mohan, Assistant Professor**

**Dr. Vidya V Devan, Assistant Professor**

**Dr. Sumalatha B S, Assistant Professor**

**Dr. Nirmal Roy V P, Assistant Professor**

**Dr. Akhil M P, Assistant Professor**

**Dr. Geetha Rani V, Assistant Professor**



Gulati Institute of Finance and Taxation (GIFT), Thiruvananthapuram, Kerala, India formerly Centre for Taxation Studies (CTS), is an autonomous institute of the Government of Kerala recognized by the Indian Council of Social Science Research (ICSSR). It is conceived as a premier national institute to promote theoretically grounded empirical research with an interdisciplinary perspective to aid policy-making at the national and sub-national levels. The uniqueness of the Institute is its faculty having a background in Commerce, Economics, and Law. GIFT offers a Ph.D. program in Social Sciences focussing on Public Economics, affiliated with Cochin University of Science and Technology (CUSAT). GIFT conducts two other programs; Post Graduate Diploma in Goods and Service Tax (PGDGST) and the Research Capacity Building Program (RCBP) besides offering training for capacity building of different stakeholders including Government officials. GIFT brings out three publications; Kerala Economy (Quarterly) Kerala Tax Reporter (Monthly) and Weekly Updates on Finance, Taxation and the Indian Economy.

The Governing Body and Executive Committee of GIFT consist of Scholars of Eminence and Senior Administrators representing both the Central and State Governments. Shri K N Balagopal, Minister for Finance, Government of Kerala, is the Chairperson of the Institute.

### Academic Programs at GIFT

- PhD Program
- Post Graduate Diploma in Goods and Service Tax (PGD GST)
- Research Capacity Building Program (RCBP)
- Multi-Level Marketing (MLM)
- Internship
- Training Programs

### GIFT Publications

- GIFT Discussion Paper Series
- Kerala Economy
- Kerala Tax Reporter (KTR)
- Innovation and Development
- Weekly Updates
- Library Content Alert Service

