

About the Certificate Course

The **Certificate Course on Data Analysis for Systems Biology** is an advanced program conducted by IBDC Team designed to develop expertise in computational biology, bioinformatics, and multi-omics integration. This program empowers participants to transform biological data into knowledge through modern analytical approaches.

Course Structure and Detailed Syllabus

The program runs for **5 Weeks** and is divided into two main modules — an **Online Preparatory Module** conducted by the IBDC Team and an **Onsite Data Analysis Module** delivered by experts at IBDC, RCB, Faridabad. The **Certificate Course in Data Analysis for Systems Biology** is an intensive program designed to build foundational and advanced skills in computational biology, bioinformatics, and multi-omics data analysis.

Preparatory Training (Online – IBDC Team)

- **Duration:** 3 Weeks (January 19 – February 6)
- **Mode:** Online Session conducted by IBDC Team
- **Schedule:** Afternoon – 2:00 PM to 5:00 PM
- **Focus Areas:** Applied Statistics, Python and R Programming, Linux, and HPC

Data Analysis Training (Offline-Expert Team)

- **Duration:** 2 Weeks (February 9 – February 20)
 - **Mode:** Onsite Session conducted by an Expert Team at IBDC, RCB, Faridabad
 - **Schedule:**
 - Morning – 9:30 AM to 12:30 PM
 - Afternoon – 2:00 PM to 5:30 PM
 - **Focus Areas:** Multi-omics Data Analysis, Transcriptomics, Epigenomics, and Systems Biology Integration
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Course Structure & Detailed Syllabus

■ Module 1: Preparatory Training (Online – IBDC Team) ▼

Duration: **3 Weeks (January 19 – February 6)**

Timing: **Afternoon 2:00 PM – 5:00 PM**

Covers: **Python, R Programming, Linux, Applied Statistics & HPC**

Total Duration: **3 Weeks – 37.5 Hours**

Python Programming – 5 Days (12.5 Hrs)

Goal: Learn Python for data analysis & bioinformatics.

- Python Fundamentals, Functions & Data Structures
- File Handling
- Pandas, NumPy, Matplotlib
- BioPython

Hands-on: Parse biological files, analyze data & visualize results.

Outcome: Work with biological datasets & build reproducible workflows.

R Programming – 5 Days (12.5 Hrs)

Goal: Use R for statistics, visualization & genomics analysis.

- Data Types & R Basics
- Data Manipulation & Visualization
- Statistical Analysis
- Genomic Data using ggplot2 & Bioconductor

Hands-on: Run statistical tests & visualize genomic data.

Outcome: Analyze genomics dataset using R effectively.

Linux – 2 Days (5 Hrs)

Goal: Work efficiently in Linux environment.

- Linux Architecture, Terminal & File Hierarchy
- Commands (Basic → Advanced)
- Bash Scripting

Hands-on: Automate tasks via shell scripts.

Applied Statistics – 2 Days (5 Hrs)

Goal: Build a foundation in statistical methods for biological data analysis.

- Descriptive & Inferential Statistics
- Hypothesis Testing
- Correlation & Regression
- Probability & Distributions
- Dimensionality Reduction
- Clustering

Hands-on: Apply statistical methods on gene-expression dataset.

Outcome: Understand hypothesis testing, modeling & unsupervised learning.

HPC – 1 Day (2.5 Hrs)

Goal: Use HPC for large-scale biological data analysis.

- IBDC-HPC Infrastructure
- Job Submission using PBS Scripts

Hands-on: Execute jobs & monitor on HPC cluster.

■ Module 2: Onsite Data Analysis Training (Offline-Expert Team) ▼

Duration: **2 Weeks (February 9 – February 21)**

Timing: **9:30 AM – 12:30 PM & 2:00 PM – 5:30 PM**

Week 1

- **Day 1:** Biological Systems & Omics Overview + Group Exercise
- **Day 2:** Data Resources, QC & ML Models
- **Day 3:** Bulk & Single-Cell Transcriptomics + DEG Analysis
- **Day 4:** Spatial Transcriptomics + Hands-on
- **Day 5:** Networks, Cytoscape, WGCNA & GNN

Weekend Project: Group Presentation on Integrated Omics Study

Week 2

- **Day 6:** DNA Variant Analysis (GWAS, LD, PLINK)
- **Day 7:** ChIP-Seq (MACS2, IGV, UCSC)
- **Day 8:** ATACseq + Chromatin Topology + Multiome Integration
- **Day 9:** Metabolomics & Proteomics + Multi-omics Integration
- **Day 10:** Final Presentations and Seminar Symposium + Closing

Assessment: Daily homework, hands-on tasks & pop quizzes.

Guide Map

■ [Click here to open Google Map location](#)

Distance of RCB From:

- **Airport:** Indira Gandhi International Airport – 40.4 km

- **Railway Station:** Old Faridabad Railway Station – 7.8 km

How to get to Regional Centre for Biotechnology, Faridabad

By Metro

- Badkhal Mor Metro Station (Violet Line) – 4 km
- Old Faridabad Metro Station (Violet Line) – 4 km
- Neelam Chowk Ajrona Metro Station (Violet Line) – 4 km
- Bata Chowk Metro Station (Violet Line) – 4 km

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