Name of the Department/Centre: Centre For Theoretical Physics

Course Type (Please tick appropriate box):

Major	☐	Discipline Specific Core	☐	Ability Enhancement.	☐
Minor	☐	Multidisciplinary	☐	Skill Enhancement.	☒
Value Added	☐	Any Other	☐		

Course Title: **Statistical Techniques**

Course Code: 25-CTP-S-151

Semester: II (two)

Total Credits: 3 **Lecture-Tutorial-Practical Breakup (LTP):** 2(Lectures) + 1(Tutorial)

Maximum Marks: 50 **No. Of Seats:** 30

Course Advisor Name: **Prof. Anjan Ananda Sen**

Course Advisor's Email: aasen@jmi.ac.in

Prerequisites: Class-XII Mathematics

Special Requirements: Algebra and Calculus knowledge at Class-XII standard is must.
Basic Computer Programming skills (Python preferred).

Expected Learning Outcomes:
The objectives of this course is train the students the Basic Statistical Techniques that can be applied to data coming from diverse sphere of life, from biology/medicine to astronomy, from commerce to social sciences. The students will learn how to interpret the data to make decisions as well as how to compare various models using data.

Course Syllabus: (Unit Wise)

Unit 1: **Basics of Probability**
Definition of probability (frequentist definition), random variable, probability distribution, cumulative probability distribution, mean, mode, median, Binomial, Normal and Poisson distribution, Central Limit Theorem.

Unit 2: **Frequentist Approach**
Definition of Statistic, Chi-Squared Distribution and Sampling Distribution, Confidence Interval, Frequentist Hypothesis Testing and P-value

Unit 3: **Bayesian Approach**
Probability as a logic, Bayesian Theorem, Prior Distribution, Likelihood Approach, Posterior Distribution, Bayesian Evidence for Model comparison and Occam's Razor.

Unit4: **Data Fitting**
Linear Regression method for Data Fitting

Reference Books:

Bayesian Logical Data Analysis for the Physical Sciences
Phil Gregory
Cambridge University Press

The supplementary Course Materials will be provided.