



# BIostatistics AND DESIGN OF EXPERIMENTS

## PROF. MUKESH DOBLE

Department of Biotechnology  
IIT Madras

**PRE-REQUISITES :** Basics of probability and statistics

**INTENDED AUDIENCE :** UG/PG Biotech programmes (core or elective) and research scientists in biotechnology, clinical trials, agriculture etc and allied fields students

**INDUSTRIES APPLICABLE TO :** Biopharma, Agriculture, fisheries and Biotechnology companies.

## COURSE OUTLINE :

Biostatistics is the application of statistics to different topics in biology including medicine, pharmacy, public health science, agriculture and fishery. It involves the analysis of data from experiments; its interpretation and drawing conclusion from the results. It is very relevant to all UG and PG level degree programmes majoring in Biotechnology and allied fields as well as practicing scientists. It involves the application of statistical theory to real-world problems, the practice of designing and conducting biomedical experiments and clinical trials. Design of experiments is planning experimental strategy, screening a large number of parameters and selecting the important ones, determining the minimum number of experiments and deciding on the mode and manner in which experiment have to be conducted. The course encompasses topics such as distribution of data, sample size, tests of significance, data reduction, regression analysis, comparison of performance of drugs in clinical trials, design of experiments, screening and second order designs.

## ABOUT INSTRUCTOR :

Prof. Mukesh Doble is a faculty at the Department of Biotechnology at IIT Madras. He has previously worked in Imperial chemical Industries (ICI) and General Electric (GE) for 20 years. His areas of research are Biomaterials, Biopolymers, and Drug design. He has published 270 papers and 10 books and filed 10 patents (including two US). He has delivered online video courses in Downstream processes and Biostatistics.

## COURSE PLAN :

### Week 1:

Introduction  
Experimental design strategy  
Data types/Binomial Distribution  
Poisson Distribution  
Normal Distribution

### Week 2:

Standardized Normal Distribution/ t distribution  
t distribution/confidence interval  
Statistical tests  
t- tests  
t- tests – continued

### Week 3:

t- tests – continued  
F- tests  
F- tests –continued ANOVA  
ANOVA-continued

**Week 4 :**

ANOVA-continued

ANOVA-continued

ANOVA-continued

ANOVA-continued

ANOVA-continued

**Week 5:**

NORMALITY TEST/ODDS RATIO

c<sup>2</sup> distribution/test

c<sup>2</sup> distribution/test –continued

c<sup>2</sup> test

Weibull distribution

**Week 6 :**

Weibull distribution-continued

Weibull distribution-continued

Nonparametric tests

Nonparametric tests/Homogeneity of variance/Beta distribution

Exponential / Hypergeometric distributions

**Week 7 :**

Hypergeometric/Log normal distributions

Design of Experiments (DOE) – Introduction

Factorial design

Full Factorial design

Fractional Factorial design

**Week 8:**

Other designs

Second order designs

Second order designs-continued

Regression Analysis Control Charts