

Ekaagra: Programs Offered

October 2021

Ekaagra: Summary of Offerings

Training-1: Statistics

1. Statistical Foundations of Data Science (SFDS): 5 parts, 10-12 hr each
2. Design of Experiments (DOE): 3 parts, 12 hr each
3. Statistics for Non Statisticians (SFNS): 2 hr high level program
4. Multi Variate Analysis (MVA): customizable
5. Monte Carlo Simulation (MCS): 10 hr

Training-2: Quality and Processes

6. Statistical Quality Control (SQC): 2 parts, 10-12 hr each
7. Quality Tools and Techniques (QTT): 15 hr
8. Reliability Engineering (REL): 15 hr, customizable
9. Seven QC Tools (7QCT): Classical and Modern, 8 hr each
10. Process Mapping (PMAP): 2 parts, 8 hr each

Training-3: Other Programs

11. Project Management (PM)
12. Negotiation Skills (NGTN)
13. Team Building (TB)
14. Communication Skills (CS)
15. Leadership Development (LD)

STATISTICS

Statistical Foundations of Data Science (SFDS) Series

SFDS-01: Basic Statistics with R

12-15 hr online course via Google Meet

All exercises will be conducted using R, thus SFDS-01 is very fundamental

➤ Part-1: Introduction to R

- ❖ Basic Operations in R – Objects and Functions
- ❖ Graphical Visualization of Data

➤ Part-2: Probability and Probability Distributions

- ❖ Probability: Conditional Probability and Bayes' Theorem
- ❖ Probability Distributions: Binomial, Poisson and Normal
- ❖ Descriptive Statistics: Central Tendency, Dispersion, Skewness and Kurtosis

➤ Part-3: Sampling Distributions and Hypothesis Testing

- ❖ T-Distribution
- ❖ Confidence Intervals
- ❖ Type-I and Type-II errors
- ❖ T-tests and ANOVA

➤ Part-4: Hypothesis Testing (cont'd)

- ❖ Correlation and Regression
- ❖ F-Test and Homogeneity of Variance
- ❖ Chi-Squared

SFDS-02: Statistical Learning – Basics of Regression

8-hr online course via Google Meet

The entire program will be done in the R Programming Language

➤ Part-1: Statistical Learning and Linear Regression

- ❖ Introduction to Statistical Learning – Supervised and Unsupervised
- ❖ Regression vs Classification
- ❖ Method of Least Squares and Linear Regression

➤ Part-2: Linear and Multiple Regression

- ❖ Model Adequacy for Linear Regression
- ❖ Multiple Regression
- ❖ Handling Qualitative Predictors

➤ Part-3: Logistic Regression

- ❖ Develop Transfer Functions to handle categorical responses
- ❖ Use the above for predictions

➤ Prerequisite: SFDS-01

SFDS-03: Statistical Learning – Advanced Regression

10-12 hr online course via Google Meet

The entire program will be done in the R Programming Language

➤ Part-1: Statistical Learning

- ❖ Quick overview of Linear Regression and Logistic Regression
- ❖ K-Nearest Neighbors
- ❖ Linear Discriminant Analysis

➤ Part-2: Resampling Methods

- ❖ Cross Validation
- ❖ Bootstrap

➤ Part-3: Linear Model Selection

- ❖ Best Subsets for Step wise selection
- ❖ Shrinkage Methods – The Ridge and the Lasso
- ❖ Principal Components Analysis (PCA)

➤ Prerequisite: SFDS-01 and SFDS-02

SFDS-04: Statistical Learning – Special Topics

10-12 hr online course via Google Meet

The entire program will be done in the R Programming Language

➤ Part-1: Non Linear Regression

- ❖ Polynomial Regression
- ❖ The Method of Splines
- ❖ Generalized Additive Models (GAM)

➤ Part-2: Tree Based Methods

- ❖ Classification and Regression Trees
- ❖ Bagging and Random Forests

➤ Part-3: Support Vector Machines

- ❖ Maximum Marginal Classifier
- ❖ Support Vector Classifier

➤ Part-4: Unsupervised Learning

- ❖ Principal Components Analysis (PCA)
- ❖ K-Means Clustering

➤ Prerequisite: SFDS-01 and SFDS-02

SFDS-05: Time Series

8-hr online course via Google Meet

The entire program will be done in the R Programming Language

- Time Series Plots
- Time Series Decomposition
- Forecaster's Toolbox
- Time Series Regression Models
- Time Series Modeling: Exponential Time Smoothing (ETS) incl. Holt-Winters
- Time Series Modeling: ARIMA class of models
- Prediction using above two classes
- Prerequisites: SFDS-01

Design of Experiments (DOE) Series

DOE-01: Basics

- **An Overview of the R Programming Language**
- **A Brief History of Experimental Design**
- **The One Factor At a Time (OFAT) Approach and its limitations**
- **The Three Pillars of DOE: Replication, Randomization and Blocking**
- **Factorial Experimentation: basic concepts**
- **Fractional Factorials: getting more with less**
- **Resolution of designs**
- **Brief Overview of Screening and Response Surfaces**
- **Audience: R&D, Engg, Quality, Production**
- **Duration : 15 hr or 3 days if F2F**
- **Prerequisite: SFDS-01**

DOE-02: Advanced

- **Response Surface Methods**
 - ❖ Box-Wilson
 - ❖ Box-Behnken
- **3 level factorials – overview**
- **Screening Designs:**
 - ❖ Plackett-Burman
 - ❖ Taguchi
- **Taguchi's Robust Designs**
- **Overview of RCBD-s and BIBD-s**
- **Audience: R&D, Engg, Quality, Production**
- **Duration : 15 hr or 3 days if F2F**
- **Prerequisite: DOE-01**

DOE-03: Mixtures

- **Mixtures vs Factorial Designs**
- **Synergism and Antagonism**
- **Transfer Functions**
- **Two Component and Three Component Mixtures**
- **Triangular Diagrams**
- **Mixture Types:**
 - ❖ Simplex Lattice
 - ❖ Simplex Centroid
 - ❖ Extreme Vertices
- **Audience: R&D, Engg, Quality, Production**
- **Duration : 10 hr or 2 days if F2F**
- **Prerequisite: DOE-01**

Statistics For Non Statisticians (SFNS)



Do you feel utterly lost and miserable when you see data?
Do you think that statistics is too important to be left to statisticians?
Have you ever got the feeling that you've been had by some shyster slicing and dicing data in a way that you think isn't quite kosher?

If yes, do tune in to

STATISTICS FOR *Non-Statisticians*

Sat 1st MAY 2021

1800-2000 IST, followed by a short Q&A session

This will be a live session on Google Meet, and will cost you a quintal of gold.

Well, not really, we're happy with a thousand Indian rupees payable in advance via G-Pay. You can pay via the QR code in this picture or transfer to this UPI ID via G-Pay: menonramdas8652@icici

Do send me a mail after you fork out your cash!

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Agenda: SFNS

- **What is Statistical Thinking?**
- **Descriptive Statistics – which measures do we use where**
- **Probability – it's deeper than you think, and in your face!**
- **Distributions – we forget this all the time**
- **Confidence Intervals – the MOST interesting concept**
- **Statistical Inference: the concept of Hypothesis Testing**
- **The Measurement of Agreement**
- **Slicing and Dicing – Simpson's Paradox**
- **Applications of Probability: Simulations**
- **Prerequisite: None**
- **This is a public program delivered once a quarter**

Multi Variate Analysis (MVA)

- Descriptive Techniques
- Decomposition of Data Matrices by Factors
- Principal Component Analysis (PCA)
- Factor Analysis
- Cluster Analysis
- Discriminant Analysis
- Correspondence Analysis
- Canonical Correlation Analysis
- Conjoint Measurement Analysis
- Audience: R&D, Engg, Quality, Sales & Marketing
- Duration : 15 hr or 2 days if F2F
- Prerequisite: SFDS-01 and SFDS-02

Monte Carlo Simulation (MCS)

- Quantitative estimation of risks involved in any process
- The range of applicability could range from manufacturing and marketing to financial planning and project management
- Used for predictive modeling, forecasting, simulation and optimization
- We recommend R Programming Language.
- Hands on solutions of your day to day problems can be taken up separately
- Audience: Sales & Marketing, Planning, Engg, Quality, R&D
- Duration: 8 hr or 1 day (if F2F)
- Prerequisite: SFDS-01

QUALITY AND PROCESSES

Statistical Quality Control (SQC) Series

SQC-01: Basics

- **Shewhart and his philosophy of control charts**
- **Charts for Continuous Data**
 - ❖ X-Bar R and X-Bar S charts
 - ❖ I-MR charts
- **Charts for Discrete Data**
 - ❖ P and NP charts for defectives – Binomial
 - ❖ C and U charts for defects – Poisson
- **Process Capability from Control Charts**
- **Gage Capability Studies**
- **Audience: Quality, Production**
- **Duration : 12 hr or 2 days if F2F**
- **Prerequisite: SFDS-01**

SQC-02: Advanced

- **Quick Revision of Charts for Continuous Data**
- **Quick Revision of Charts for Discrete Data**
- **Other types**
 - ❖ Cumulative Sum (Cusum) Charts
 - ❖ Exponentially Weighted Moving Average (EWMA) charts
- **Process Capability from control charts**
- **Integrating Engineering Process Control (EPC) with Statistical Process Control**
- **Audience: Quality, Production**
- **Duration : 12 hr or 2 days if F2F**
- **Prerequisite: SFDS-01 and SQC-01**

Quality Tools and Techniques (QTT)

- **Process Mapping**
- **Root Cause Analysis including Six Thinking Hats**
- **Mind Maps**
- **Failure Modes and Effects Analysis (FMEA)**
- **Creativity**
- **Generation and Evaluation of Solutions**
- **Audience: all functions in a company**
- **Duration : 15 hr or 3 days (if F2F)**
- **Prerequisite: None**

Reliability Engineering (REL)

- **Basic Terminology such as MTBF, MTTF, MTTR, Hazard rate and Availability**
- **Distributions: Normal, Exponential, and Weibull**
- **Statistical Inference**
- **Probability plotting**
- **Analysis of Life Data – complete, singly censored and multiply censored**
- **Reliability Modeling**
- **Calculation of reliability parameters**
- **Highly Accelerated Life Testing (HALT)**
- **Highly Accelerated Stress Screening (HASS)**
- **Audience: R&D, Engg, Quality**
- **Duration : 15 hr or 3 days (if F2F)**
- **Prerequisite: SFDS-01**

Seven QC Tools (7QCT) – Traditional

➤ **TRADITIONAL**

- ❖ Check Sheet
- ❖ Pareto
- ❖ Cause and Effect (Ishikawa) Diagram
- ❖ Stratification
- ❖ Histogram
- ❖ Scatter Diagram
- ❖ Control Chart

➤ **Audience: all functions in a company**

➤ **Duration: 12 hr or 2 days (if F2F)**

➤ **Prerequisite: None**

Seven QC Tools (7QCT) – Modern

➤ MODERN

- ❖ Affinity Diagram
- ❖ Interrelationship Digraph
- ❖ Tree Diagram
- ❖ Prioritization Matrix
- ❖ Matrix Diagram
- ❖ Process Design Program Chart (PDPC)
- ❖ Activity Network Diagram

➤ **Duration : 12 hr or 2 days (if F2F) days**

➤ **Audience: all functions in a company**

➤ **Prerequisite: None**

Process Mapping (PMAP)

- **The rationale for Process Mapping**
- **SIPOC**
- **Flow Charting and Process Variables Mapping**
- **Swim Lanes or Cross Functional Maps**
- **Value Stream Mapping**
- **Audience: Sales & Marketing, Planning, Engg, Quality, R&D**
- **Duration: 12 hr or 2 days (if F2F)**
- **Prerequisite: None**

OTHER PROGRAMS

Other Programs

- **Project Management (PM)**
- **Negotiation Skills (NGTN)**
- **Team Building (TB)**
- **Communication Skills (CS)**
- **Leadership Development (LD)**
- **All these programs are scoped out in consultation with the client**

Mathematical Foundations of Data Science (MFDS) Series

MFDS: Some Thoughts

- **We will roll this out by April 2022**
- **This will cover the following subjects**
 - ❖ Linear Algebra
 - ❖ Multivariate Calculus
 - ❖ Probability
- **Each subject will be covered in 5-6 sessions of 2 to 2.5 hr each**

To Learn More About Us.....

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