

Importance of statistics in engineering:

For any structure to be built properly and safely, the plan has to be accurate down to the last detail. This can only be achieved with perfect math.

Therefore without statistics and math in engineering, it would be almost impossible to build to the same standard and to the same time-frame.

Everything is worked out by statistics from the quality control to the number of items needed to fulfill the project. It is really at the heart of everything.

Engineering is a very logical process and statistics help back any decision up and no risks are never taken due to it being built on facts and solid maths.

Statistics :

Statistics is concerned with scientific methods for collecting - organizing - summarizing - presenting and analyzing sample data as well as drawing valid conclusions about population characteristics and making reasonable decisions on the basis of such analysis.

According to Fisher (1947) - the science of statistics is essentially a branch of applied mathematics and may be regarded as mathematics applied to observational data.

Scope of statistics :

The scope of statistics is so vast and ever-increasing that not only it is difficult to define but also unwise to do so. It is a tool of all sciences indispensable to research and intelligent judgement and has become a recognized discipline in its own right. There is hardly any field whether it be trade, industry or commerce - economics, biology, botany, astronomy, physics, chemistry, education, medicine, sociology, psychology or technology where statistical tools are not applicable.

The applications of statistics are so numerous that it is often remarked "statistics is what statisticians do". A few fields in which statistics is applied are given below -

- (i) Statistics and State
- (ii) Statistics in Business and Management
- (iii) Statistics and Economics
- (iv) Statistics and physical sciences
- (v) Statistics and Natural sciences
- (vi) Statistics and Research
- (vii) Statistics in agriculture
- (viii) Statistics in socio-economic study
- (ix) Statistics in environment
- (x) Statistics in medicine
- (xi) Statistics in psychology and education
- (xii) Statistics in production industry
- (xiii) Statistics in astronomy ; etc.

Population :

An aggregate of all individuals or items (actual or possible) defined on some common characteristics is called a population.

Example : First year honours students of statistics (session: 2014-2015) of PUST constitute a population. Here, the common characteristics are :

- (i) students of PUST
- (ii) students of first year honours in statistics
- (iii) and students of the session 2014-2015

Sample :

A representative small part of a population is called a sample. For example, a group of students representing the first year honours students is called a sample.

Random sample :

When a sample comes from a random experiment, then the sample is a random sample. \therefore

Variable :

A variable is a measurable quantity which can vary within its domain. For example, family size is a variable - because it is a measurable quantity within its domain.

All possible values of a variable will constitute its domain. For the variable family size, if the lowest value in the measurements is considered to be 1 and the highest value is 30 - then the domain of family size is obviously (1-30).

Random variable :

If each of the values of a variable is associated with probability then it is called a random variable.

For example, the variable family size can be considered as a random variable as it takes each of its values with certain probability.

Parameter :

A constant, which is a function of population values, can characterise the variable of the underlying population to some extent and is usually unknown - is called a parameter.

Statistic : Any function of sample values which is an estimate of the parameter and which is a known value is called a statistic.