Al-Mustaqbal University
Department of Techniques of Fuel and Energy Engineering
Second stage
Subject: Engineering Statistics UOMU027046
Lecturer:  Zahraa Salah Hadi
$2^{nd}$ term – Lect 1

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# Introduction

## Statistics:

It means collecting data related to population census,

number of births and deaths, or data related to weather such as

temperature and relative humidity, etc., and then it began to

include presenting this data in a concentrated manner in tables

linked to scientific methods  and graphs, but modern statistics is

related to collecting, organizing, summarizing and presenting

data for the purpose of inference for decision-making

## Statistics is divided into two parts:

1. **Descriptive statistics:** It aims to integrate and summarize

    numerical data in order to transform it from a mere quantity

    of numbers into another form or image that can be

    understood and absorbed by simply looking. Most of the

    methods used in it are measures of central tendency,

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measures of dispersion, and measures of correlation and regression. The use of any of them depends on the type of data and the level of measurement, whether it is nominal, descriptive, ordinal, categorical, or proportional. The description function is considered one of the primary functions of statistics that is used to explore the facts of various phenomena (social, economic, geographical, etc.).

**2. Inferential Statistics:** This section of statistical methods is based on a set of quantitative statistical theories, the most important of which are probability theory and sampling theory, which represent the link between descriptive and inferential statistics. This type of statistical method seeks to reach quantitative estimates of the features and characteristics of study communities through the available

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graphic information about the samples selected from those communities.

**Applications of statistics**: Statistics has various applications in all fields, including the engineering field. For example, in the field of civil engineering, it is used in structural designs and studying the nature of traffic to find appropriate ways to control it and in designing storage damages.

There are two positions to interpret any possibility:

1. Objective position: The objective position is applied to incidents that repeat themselves, such as the productivity of concrete molds in a prefabricated building factory.

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**2.** Personalistic position: It depends partly on personal opinion, and in our curriculum, we do not deal with this position.

## Statistical terms

- **Sample:** A sample represents a specific group of elements of society. Twenty concrete wall blocks are considered a sample of the factory's productivity for a year or more, and one hundred individuals in a city are considered a sample of the population.

- **Random sample**: A sample is considered random if each element of the community is given the same opportunity to be selected to be part of this sample.

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This element may be a bearing force resulting from examining a concrete mold from the production of a prefabricated building factory.

- **Independent Sample:** Two samples are said to be independent if they are chosen randomly, i.e., each one of them is a random sample.

- **Statistical Variable and Variate:** The statistical variable refers to specific characteristic of the data and is symbolized by (X). The specific variable is the specific value of the variable and is symbolized by (x). It may represent stress, strain, or discharge in rivers, and (X) represents the value that this variable takes.

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- **Random Variable:** The value of a random variable is a number obtained as a result of an experiment and is either discrete or continuous. A discrete variable has a finite sample range and is called a discrete or distinct random variable. For example, the number of students in a lecture hall or the number of vehicles on a certain bridge are considered discrete variables because the determinant variable takes a specific range or specific numbers, unlike the sample range of a continuous random variable, which is not continuous and takes any value within the range of values.

- **Independent and Dependent Variable:** Two variables are said to be independent if the result of one of them is not affected by the value of the other being

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fixed. When two coins are thrown into space, the direction that the first coins take when they settle on the ground does not affect the direction that the second coin takes. The direction is the variable and the two coins are the independent variables. However, when studying stress and strain in a concrete column, for each value of stress, the strain takes a specific result or value, so the stress is an independent variable and the strain is a dependent variable.