Types of mathematics and engineering

Engineering:

Engineering is the word that does not have proper definition. Every person thinks with different point of view so create different definition but most commonly used definition of engineering is, this is the practical application of science to commerce or industry. As we know that the work of scientist is to know, the engineer to do i. e. the engineer brings the knowledge from science to solve the problems. Engineering also give account of costs, safety, performance and limitations of the given resources.

Mathematics:

Mathematics is defined as the study of quantities and relations with the help of numbers and symbols. So, mathematics and engineering work together as they are right hand to each other because engineering uses mathematical operations in calculation of their projects. Mathematics is very famous in modern industry. So, mathematics is found in every sector of the job market as in engineering research, telecommunications, computer services and software, energy systems, computer manufacturers, aerospace and automotive, chemicals and pharmaceuticals, and government laboratories, among others.

Different types of mathematics

1. Geometry

2. Trigonometry

3. Calculus I and II

4. Linear Algebra

5. Differential Equations

6. Statistics.

1) Geometry: Geometry (geo = earth, metria = measure) is a part ofmathematicsdeals with the size, shape, relative position of figures and also includes solving of space. Geometry is one of the oldest sciences we use till now.

FIG; Representation of different shapes

2) Trigonometry: Algebra is the branch of mathematics concern with the study of rules of operations and the things constructed from them, including terms, polynomials, equations and algebraic structures. It works with the geometry, analysis, topology, combinatory, and number theory, algebra is the one of the most important part of the mathematics. Statements based on these variables are solved by using the rules of operations that apply to numbers, eg: multiply, subtraction, addition, etc.

FIG: A polynomial equation

3) Calculus: Calculus (It is a Latin word, calculus, a small stone used for counting) is a branch in mathematics works on limits, functions, derivatives, integrals and infinite series. This part of mathematics deals with a major part of modern mathematics education. It is divided into two major branches, differential calculus and integral calculus. It is the study of change occurs on the limits, same as that of geometry which is the study of shapes and algebra is the study of change, in the same way that geometry is the study of shape and algebra is the study of operations and their application to solving equations. Calculus is very much used in science, economics and engineering and can solve using calculus we can't imagine its solution without calculus.

Differential Equations

Integral Calculus

4) Linear Algebra: Linear algebra is a branch ofmathematicsdeals with the study ofvectors, vector spaces(also called linear spaces), linear maps(also called linear transformations), andsystems of linear equations. Vector spaces are the very important part in modernmathematics; thus, linearalgebrais widely used in bothabstract algebraandfunctional analysis.

5) Differential Equations: A differential equations are the mathematical equations for unknown functions of one or more variables that relate the values of the functions by itself and its derivatives. Differential equations play a very important role in physics, engineering, economics and other subjects of science.

Differential equations are use in almost every area of science and technology. Newton's Laws also use differential equations which allow one to relate the position, velocity, acceleration and various forces acting on the body and state this relation as a differential equation for the unknown position of the body as a function of time.

6) Statistics: Statistics is the part of mathematics, as it is basically the science of making good and efficient use of numerical data related to groups of individual numeric. It basically deals with not only the collections, analysis and interpretations of the collected data, but also the planning of the collection of data.

Different types of engineering are:

  1. Computer science engineering.

2. Chemical engineering.

3. Civil engineering.

4. Mechanical engineering.

5. Electrical engineering.

6. Aerospace engineering.

7. Electrochemical engineering.

8. Nuclear engineering.

9. Marine engineering.

10.   Architectural engineering.

11.   Environmental engineering.

Let us discuss them separately:

1) Computer science engineering:
All computer programs do some form of counting as a small part of a task.

Counting a hundred items does not take a long time, even without a

computer but some computers may have to count a billion items or more. If

the counting is not done efficiently, it may take days for a program to finish a

report which may take few minutes to check. For example, when we want to

find winning lottery ticket numbers of all lottery tickets. There are various

techniques, and tools, etc. commonly used in software. Examples include:

- Boolean Algebra

- Object Oriented Programming

- Data Structures (lists, sets, queues, stacks, etc.)

- Algorithms (sorting, searching, traversing, etc.)

- Relational Theory

- Set Theory

- Type Theory

The above examples are based on mathematical calculations.

2) Chemical engineering:

Mathematics is very useful in preparing various components of compounds, as compounds are made of different chemicals so addition of chemicals are properly measured and the quantity to be put are calculated by different mathematics forms, as follow:

- Geometry

- Trigonometry

- Calculus I and II

- Linear Algebra

- Differential Equations

- Statistics.

3) Civil Engineering:

Civil engineering also cannot move without mathematics as this engineering also includes various types of calculations for a work to be going on. For example: We must calculate how much strength a straight bar will bear (like a bridge) before breakage. How much weight can a cable of c amount of strands take before it pulls apart? The branch mathematics used in this engineering is as follow:

- Geometry

- Differential Equations

- Relational Theory

- Statistics.

4) Mechanical engineering:

The main work of mechanical industry is manufacture industrial machinery, consumer products, and etc. They may make sketches and rough layouts, record and analyze data, make calculations and estimates and all the above things need mathematics. This engineering also includes topics as thermodynamics, heat transfer, fluid mechanics, machine design and mechanics of materials, manufacturing, system dynamics, numerical modeling, vibrations, turbo machinery, combustion, heating, ventilating, and air conditioning which also needs physics which is based on math. The different forms of mathematics which mechanical engineering want are as follows:

- Calculus 1, 2, and 3
- Linear Algebra
- Differential Equations.

5) Electrical engineering:

Mathematics is also very helpful in electrical engineering. As preparation of circuits consist of many calculations if we want efficient circuit to be placed. Mathematics is helpful as follows:

a) Modeling and study of electric circuits using mathematical differential equations of first, second and higher orders.

b) The design of system such as filters using Laplace and Z transforms.

c) Electrical applications for motion using special equations.

So, this engineering follows following branches of mathematics:

- Arithmetic

- Algebra

- Geometry

- Calculus

- Differential equations

- Complex analysis

- Probability and statistics.

For example: 5 gauge wires can carry an amount of current, with a loss of b over c distance. How much wire of that size can we have to lay before we lose too much current for specific circuit?

6) Aerospace engineering:
The aerospace engineering is for manufacturing and maintenance of aircraft and space vehicles. This engineering uses computer and communication systems. So, this engineering includes all the branches of math which are included in computer engineering and mechanical engineering. They are:

- Calculus 1, 2, 3

- Linear Algebra

- Differential Equations.

7) Electrochemical Engineering:
The electrochemical engineering is the engineering which is the combination of both electrical as well as chemical engineering. So, this engineering also needs various operations and calculations for production of various components used in different products.

8) Nuclear engineering:

The nuclear industry consist of various tasks such as production, handling, and use of nuclear fuel and the safe disposal of waste produced by the generation of nuclear energy To be a nuclear engineer a person need to have proper knowledge of physics, computer, chemistry and mathematics so, in short a person should have proper knowledge of all fields of science including mathematics.

9) Marine Engineering:

As we know that this engineering is related to Ships sailing in the oceans and seas. Ships has to find their way in the water by measuring the directions as there are no mile stones in water as on land. To find out the direction lots of calculations has to be done which need mathematics. The location of the ship is finding out by use of mathematics with combination of physics.

10) Architectural Engineering:

Architectural Engineering is a type pf engineering which is used to construct, plan and design of buildings and other structures. So, these work can't be completed without using calculations and calculations use mathematics. Suppose if an engineer has to design bridge it ahs to do various calculations, we do have formula for calculating strength of bridge

$S = C(1 - e^{-kt})$

Where S= strength of bridge

C= Constant

k= Constant

t= time

11) Environmental Engineering:

This engineering is related to the developing methods and devices used in controlling, preventing the environmental disasters. In this the scientist and environmental engineers check and develop equipment related to air pollution and recycling of waste products. Water is also inspected and water treatments are also developed. The all above mention work need lots and lots of mathematical calculations. As inspection of various environmental disasters need calculation and there remedies also don't go without calculations. So, again mathematics is used here.

Conclusion:

So, from our above discussion we concluded that engineering is very broad branch and mathematics plays a very important role in it. As I had already discussed the use of mathematics in engineering. We have to do calculations in almost every engineering to some or large extend.