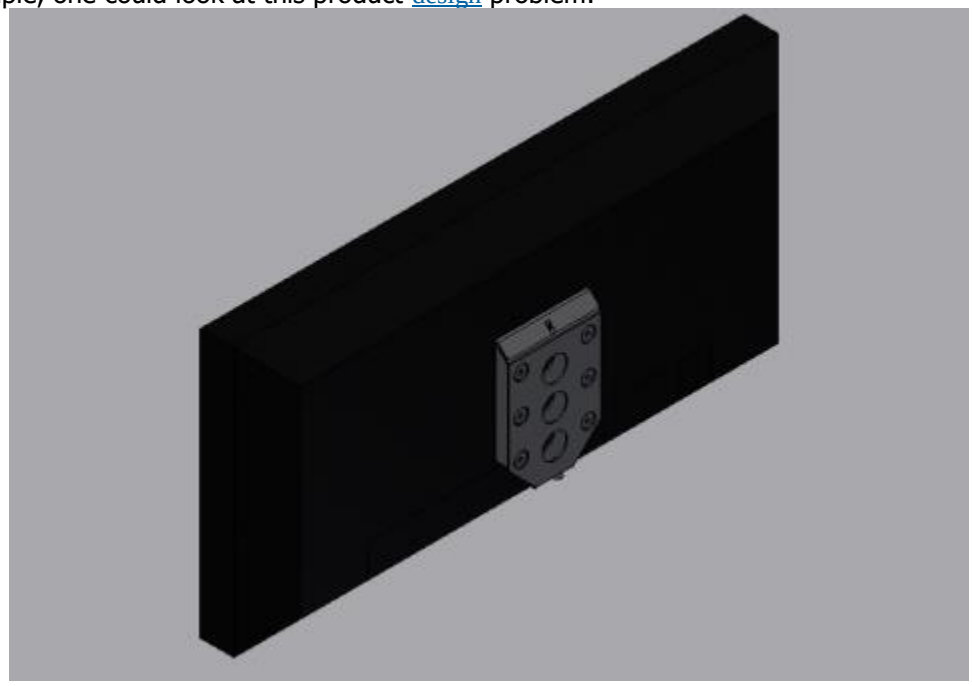
WHAT IS ENGINEERING?

Engineering can be defined as the application of practical and scientific knowledge to the solving of a problem through the use of a methodical process.
More simply put, at its most fundamental level engineering is problem solving.

The solutions to these problems can take many forms. Maybe the engineer is creating a physical thing to solve a problem, maybe they are creating or improving a process for doing something, or maybe they are determining why something happened the way it did. The many different types of problems are all related to engineering, especially if they are solved using a methodical process (more on this later.)

The above definition mentions that engineers apply practical and scientific knowledge to their problem solving. Some would say that engineers take scientific knowledge and find a practical application for it to benefit humanity. To be successful, engineers must become familiar with a wide variety of fields, and experts in some specific fields.

As an example, one could look at this product design problem:



In order to design the above bracket to mount a TV to a wall, an engineer would need a wide variety of background knowledge. They might need to draw on knowledge of classical mechanics to determine the forces the TV would exert on the bracket. They would need knowledge of structural design to figure out a bracket capable of withstanding the forces. The engineer would need background in the manufacturingprocesses that are required to make the bracket, and design it so it can actually be produced. They would need some background on the types of surfaces it would mount to, and the screws & nuts that would be used to mount it so they can determine what screws to use and how many screws are required to keep the bracket from falling off the wall. The engineer would need some basic idea of how the bracket would be installed by the final customer and create a good user experience, as well as knowledge of how the bracket would be used after it is installed (to be a good product, does it

need to tilt up and down? Does it need to tilt left and right?). The engineer would also need some knowledge of TVs; to be a good product, the bracket will hopefully be able to mount a wide variety of television sets – are there any standards TV manufacturers design for which would allow for universal mounting?

This knowledge is all necessary to engineer and design the best possible solution. The example above includes a variety of the different types of scientific knowledge. It also has quite a bit of practical knowledge. So where do engineers get all this knowledge? Much of it would be learned through higher education – to become an engineer, one must complete a degree program from an accredited engineering college in the field they which to practice in. The rest of the knowledge would be learned through training, or on-the-job experience. For example, a young engineer may be taught about types of fastening hardware (nuts & bolts) from a more experienced engineer during their first few years of work.

WHAT IS DESIGN?

The term "design" was listed above, but what exactly does this mean? When it is said "engineers design a bracket" what is being described?

Design is defined in the dictionary as follows:

- To conceive of fashion in the mind; invent
- To formulate a plan for; devise
- To plan out in a systematic, usually graphic form
- To create or contrive for a particular purpose or effect
- To create or execute in an artistic or highly skilled manner

A simpler definition might be*: Design is thinking of and creating something new, or adapting something old to solve a problem and/or satisfy a need*. One should note that this definition has the key words "problem solving" again.

DISCIPLINES OF ENGINEERING:

There are many different types of engineers, each specializing in a different field of knowledge, each with a specific set of problems they specialize in solving. There are almost as many fields of engineering as there are fields of scientific inquiry! Some examples are listed below. Keep in mind that this list is not all-inclusive.

- Acoustical Engineering
- Aeronautical Engineering
- Aerospace Engineering
- Agricultural Engineering
- Architectural Engineering
- Automotive Engineering
- Biological Engineering
- Biomechanical Engineering
- Biomolecular Engineering
- Ceramic Engineering
- Chemical Engineering
- Civil Engineering

- Computer Engineering
- Control Engineering
- Electrical Engineering
- Electronic Engineering
- Energy Engineering
- Environmental Engineering
- Heating, Venting, Refrigerating & Air-Conditioning Engineering
- Industrial Engineering
- Manufacturing Engineering
- Materials Engineering
- Mechanical Engineering
- Mechatronics
- Metallurgical Engineering
- Mining Engineering
- Molecular Engineering
- Nano Engineering
- Naval / Ocean / Marine Engineering
- Nuclear Engineering
- Optical Engineering
- Paper Engineering
- Petroleum Engineering
- Plastics Engineering
- Power Engineering
- Process Engineering
- Structural Engineering
- Systems Engineering
- Thermal Engineering
- Transportation Engineering