

The logo of Galgotias University is a circular emblem with a stylized 'G' shape in the center. The 'G' is composed of several curved segments in shades of yellow, orange, and blue. The background of the emblem is a light, textured grey.

**Unit 5:
L-1**

Reliability Concepts

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Learning Objectives

A **control chart** is a graphical tool for monitoring the activity of an ongoing process. Control charts are sometimes referred to as **Shewhart control charts**, because Walter A. Shewhart first proposed their general theory. The values of the quality characteristic are plotted along the vertical axis, and the horizontal axis represents the samples, or subgroups (in order of time), from which the quality characteristic is found.

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INTRODUCTION

- Even the most efficient maintenance teams experience equipment failures. That's why it's critical to plan for them.
- Managing failure correctly can help you to significantly reduce its negative impact.
- Across industries and applications, we've found that those are MTTR, MTBF, and MTTF.

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Mean Time To Repair (MTTR)

- Mean Time To Repair (MTTR) refers to the amount of time required to repair a system and restore it to full functionality.
- This includes repair time, testing period, and return to the normal operating condition.

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$$\text{MTTR} = \frac{\text{total maintenance time}}{\text{total number of repairs}}$$

- **A couple of things to note:**

- MTTR gives an average of what to expect.
- To obtain reliable results, every repair must be handled by competent and trained personnel that can follow well-defined procedures.

- **Why is MTTR helpful?**

- It often results in production downtime, missed deadlines, loss of revenue, and so on.
- Maintenance managers can use MTTR to inform maintenance decisions
- it tells you how efficiently you can respond to and repair any issues with your assets.

Mean Time Between Failures (MTBF)

- MTBF helps you predict how long an asset can run before the next unplanned breakdown happens.
- The term MTBF is used for repairable systems, but it does not take into account units that are shut down for routine scheduled maintenance or routine

- How

$$\text{MTBF} = \frac{\text{total operational time}}{\text{total number of failures}}$$

- **Why is MTBF helpful?**

- MTBF is an important marker in reliability engineering and has its roots in the aviation industry, where airplane failure can result in fatalities.
- Even everyday decisions like buying a particular brand of car or computer are affected by the buyer's desire for a product with a higher MTBF than what the next brand has to offer.
- Although MTBF does not consider planned maintenance, it can still be applied for things like calculating the frequency of inspections for preventive replacements.

Mean Time To Failure (MTTF)

- Mean Time To Failure (MTTF) is a very basic measure of reliability used for non-repairable systems.
- Its value is calculated by looking at a large number of the same kind of items over an extended period and seeing what is their mean time to f

- How do

$$\text{MTTF} = \frac{\text{total hours of operation}}{\text{total number of units}}$$

- **Why is MTTF helpful?**

- MTTF is an important metric used to estimate the lifespan of products that are not repairable.
- MTTF is important to reliability engineers when they need to estimate how long a component would last as part of a larger piece of equipment.
- MTTF becomes the primary indicator of the equipment's reliability, intending to maximize asset lifetime. Shorter MTTF means more frequent downtime and disruptions.

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