

## Reliability Training

Some companies are interested in developing internal reliability engineers. Sadly most university programs do not cover this topic in any depth. Programs that are available are few and far between with only limited opportunities dependent entirely on the schedules and programming at a few select universities world wide.

We offer three courses in reliability that will educate your engineers in a way that few can to deal with reliability problems.

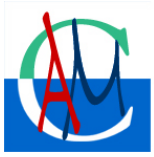
The first two courses are very similar and have the same outline, but they are taught for two different levels of student – intermediate and advanced. The intermediate level participant would be a graduate engineer or engineering technologist new to the field of reliability and maintenance engineering. The advanced level would be for experienced maintenance and reliability engineers.

Our courses are taught by engineers with advanced degrees in reliability who are current with available technology and methods.

### ***Course Content for “Basic Equipment Reliability” and “Reliability Mathematics”***

#### **Duration: 5 days for each course**

- Introduction on Reliability Engineering
- Defining Failure
- Time to Failure
- Reliability Function
- Failure Rate Function
- Mean Time to Failure
- Mean Residual Life
- Censored Data
- Non Parametric Models
- Common Life Time Probability Distributions (Exponential, Weibull, Normal, ..)
- Maximum Likelihood Method
- Homogeneous Poisson Distribution
- Markov Processes
- Failures And Failure Classifications
- Failure Modes, Effect, and Criticality Analysis
- Fault Tree Analysis
- Cause and Effect Diagrams



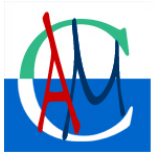
# Reliability

- System Reliability (series, parallel, etc.)
- Complex Systems
- Standby Systems
- System Availability Assessment
- Non-repairable Systems
- Repairable Systems (Perfect and Imperfect Repair Processes)
- Reliability of Safety Systems (Failure Finding Intervals, Inspections)
- Introduction on Type of Maintenance (Preventive, Corrective, Opportunistic, Predictive)
- Preventive Replacement Policies (Age Based, Calendar Based, Condition Based)
- Condition Monitoring Data (Condition Indicators, PF Intervals, etc.)
- Regression Models (To Model Condition Monitoring Data)
- Condition Based Maintenance
- Reliability Data Sources
- Reliability Data Analysis
- Using Bayesian and Expert Knowledge in Reliability Modelling

**Note1:** Each topic will be accompanied by several examples related to maintenance activities

**Note 2:** Above course description will be for both “*Basic Equipment Reliability*” and “*Reliability Mathematics*”, the details and depth depends on the average knowledge of the class. For intermediate participants the focus would be more on the concepts and showing them how those concepts would apply to their daily activities. They will be required to do a rather simple project as part of the course.

For advanced level participants more emphasize would be put on using the techniques in relatively complex situations. They will be required to do data gathering, data cleaning, data analysis, and semi optimal decision makings. How to make cost optimized decisions would be delivered in “*Advance MR and Replacement*” course.



## ***Advanced MR and Replacement***

### **Duration: 5 days**

- Review on Basics of Maintenance Reliability Engineering (depending on participants' level it can take from couple of hours to couple of days)
- From Maintenance Management to Physical Asset Management
- Optimal Replacement Times for Equipment Whose Operating Cost Increases with Use (Cost Minimization)
- Optimal Preventive Replacement Interval of Items Subject to Breakdown
- Optimal Preventive Replacement Age (Cost Minimization)
- Optimal Preventive Replacement Age and Interval to Minimize Downtime
- Optimal Group Replacement
- Repairable Systems Replacement Decisions
- Spare Part Provisioning and Optimization
- Optimal Inspection Frequency
- Finding Optimum Failure Finding Interval
- Condition Based Maintenance Decisions (Cost Optimization and Downtime Minimization)
- Basics in Engineering Economy
- Decision Analysis and Economical Considerations
- Capital Equipment Replacement Decisions (Constant Equipment Utilization)
- Optimal Replacement Policy for Capital Equipment Whose Planned Utilization is Variable
- Capital Equipment Replacement Decisions Taking into Account Technological Improvements
- Lease vs. Buy Decisions
- Repair vs. Replacement Decision for Capital Equipments
- Maintenance Resource Optimization
- Finding Right Number of Maintenance Crews (Cost Optimization)

**Note:** All the models will be accompanied by real case studies in the area of maintenance. Different software packages such as AGE/CON, OREST, EXAKT, PERDEC, SMS, etc will be thought to the participants and will be used to solve sample problems