Practical Reliability Engineering - From Planning to Test Data Analysis and Extrapolation

Training Programme
by
Dream Catcher Consulting Sdn Bhd

02 - 04 Jul 19
Dream Catcher Consulting Sdn Bhd, Penang

303-4-5 & 303-4-6 Block B, Krystal Point
Jln Sultan Azlan Shah 11900 Sg Nibong Penang, Malaysia
http://dreamcatcher.asia
enquiry@dreamcatcher.asia
+604 640 7111 / 7112
+604 640 7110
Synopsis

Reliability is crucial to the success of product sales in today's competitive market. Reliability test is now a common routine to most of the manufacturing. However, the analysis of reliability test data is not straightforward since it involves advanced statistics. There are many existing software available for reliability data analysis, but most of them have inherent assumptions that are suitable for system reliability rather than component reliability. Also, without understanding the impact of these assumptions, analysis results could be invalid.

This course provides a basic understanding of reliability data analysis, and the various type of reliability data as well as their respective analysis methodology. The planning of accelerated life testing will also be presented, and the extrapolation of the accelerated test data to normal operating conditions will be discussed in details. Misconception in accelerated life testing and their extrapolation will be discussed.

What previous participants say about this course
Answers to the question 'what did you like most about the course'

- "Clear presentation and willingness of Dr Tan to discuss topics outside of course contents" - 21 Jun 06
- "Sample size software, time to failure calculation" - 21 Jun 06
- "Instructor has vast knowledge on the subject matter" - 21 Jun 06
- "Challenging the industry standard" - 21 Jun 06
- "Explanation of the reliability concept & application of the equation" - 21 Jun 06
- "Knowledgable instructor" - 21 Jun 06
- "Contents of the course & detailed explaination by the lecturer" - 21 May 07
- "The conceptual description and explaination provided has help me to understand the reliability theory, calculations & applications" - 21 May 07

What You Will Learn

- Reliability concepts and types of reliability data
- Non-parametric analysis of reliability data and its limitation
- Parametric analysis of reliability data and its usefulness for reliability improvement
- Probability plotting in reliability data analysis and its precautions
- Planning of life tests for products
- Various accelerated test models and their use in extrapolation of test data for reliability prediction.

Who Should Attend

- R&D engineers
- Reliability engineers
- Process engineers

Prerequisite
Knowledge of basic statistics.

**Course Methodology**

This course is presented classroom style, with case studies to illustrate the concepts taught.

**Course Duration**

3 day(s), 9am - 5pm

**Course Structure**

**Module 1 - Reliability Concepts and Reliability Data**
This module introduces some of the basic concepts of product reliability. Section 1 explains the relationship between quality and reliability and outlines how statistical studies are used to obtain information that can be used to assess and improve product reliability. Section 2 explains, in general terms, important qualitative aspects of statistical models that are used to describe populations and processes in reliability applications. Section 3 emphasizes the important distinction between studies focusing on data from repairable systems and nonrepairable units. Section 4 describes a general strategy for exploring, analyzing, and drawing conclusions from reliability data.

**Module 2 - Models and Censoring for Failure Time Data**
This module introduces basic concepts of modeling failure-time processes. The basic relationships among cumulative distributions, densities, survival, hazard, and quantile functions for modeling of continuous failure-time processes are explained. The module also explains briefly the importance of censoring, censoring mechanisms, and important assumptions about censoring mechanisms, needed for proper application of the methodology in reliability data analysis.

**Module 3 - Non-Parameteric Estimation**
The nonparametric (model-free) estimates described in this module are used as a tool for reliability data analysis. Section 1 starts with a simple method that applies to problems with complete data or single censoring. Section 2 explains the basic ideas of statistical inference and introduces the ideas behind the use of confidence intervals. Confidence intervals for complete data or single censoring are described in Section 3. The methods are generalized to the commonly encountered multiple censoring in Section 4. Simultaneous confidence bands (used for helping to choose a model) are presented in Section 5.

**Module 4 - Parametric Distributions**
This module introduces some basic ideas of parametric modeling and the most important parametric distributions. Parametric distributions are used extensively in reliability data analysis. Section 1 explains some of the basic concepts and motivation for using parametric models. Section 2 describes important functions of parameters like failure probabilities and distribution quantiles. Section 3 introduces the important location-scale family of distributions. Section 4 gives detailed information on these and the important log-location-scale distributions.

**Module 5 - Probability Plotting**
This module presents the important topic of probability plotting. Section 1 explains the basic concepts of probability plotting. Section 2 explains aspects of the practical application of probability plots, including the use of simulation to help interpret such plots.
Module 6 - Planning Life Tests
This module provides tools for evaluating and controlling estimation precision for a life test when censored data are expected. Section 1 introduces the basic ideas of test planning and uses simulation to illustrate and explain the effect that sample size has on sampling variability. Section 2 shows how to compute approximate sampling variability directly. Sections 3 and 4 show how to find the sample size needed to control sampling variability (or precision) and illustrate the ideas for the normal and exponential distribution. Section 5 applies these methods to problems involving Type I censored data with the Weibull and lognormal distributions. Section 6 describes methods for planning a test to demonstrate conformance with a specified reliability standard.

Module 7 - Accelerated Test Models
This module describes models used for accelerated tests and introduces concepts of physics of failure. Section 1 motivates and describes the general methods for accelerating reliability tests. Sections 2, 3, and 4 describe, respectively, use-rate, temperature, and voltage acceleration. Section 5 describes some models with a combination of accelerating variables. Section 6 describes some other common forms of accelerated testing, and Section 7 described some potential pitfalls of accelerated testing.

Module 8 - Hand-on for Practical Reliability Problems

Course Instructor(s)

Prof Dr Tan Cher Ming

Dr. Tan received his B.Eng degree (Hons) in Electrical Engineering from National University of Singapore in 1984, and the M.A.Sc degree and Ph.D degree in Electrical Engineering from the University of Toronto, Canada in 1988 and 1992 respectively. He is currently an IEEE Distinguished lecturer in the Electronic Device Society, Founding Chapter Chair of IEEE Nanotechnology Chapter, Immediate past chair of the IEEE Singapore Section, a senior member of IEEE, Fellow of Singapore Quality Institute, Chairman of the Certified Reliability Engineer Board in Singapore Quality Institute, Senior Scientist of Singapore Institute of Manufacturing Technology and Faculty Associate of Institute of Microelectronic, Singapore. He is also listed in the Who's Who in Science and Engineering as well as Who' Who in the World due to his achievement in Science and Engineering. He has also been elected to be in the Research Board of Advisors in the American Biographical Institute and the International Educator of the Year 2003 by the International Biographical Center, Cambridge, England.

He has organized many international conferences, and served as the Chair person for a few international conferences such as SPIE International Symposium on Reliability, IEEE Conference on Integrated Circuits and Systems etc. He is now the Conference General Chair of the IEEE International Conference on Nanoelectronics. He has also given several invited talks and keynote speech to several international conferences on reliability. He is a guest editor of the International Journal of Nanotechnology, and serves in the reviewer board of many international Journals.

Upon completion of his Ph.D degree in 1992, he worked in Taiwan for 5 years as a Quality and Reliability Manager as well as Engineering Principal Consultant in LiteOn Power Semiconductor Corp. He has turned around the quality system of the entire company and her subsidiaries in China and US, and introduced a new outgoing quality inspection system which was the first of its kind in Asia, and attracted a number of large MNC as her customers, including Motorola, General Electric etc.
In 1996, he joined Chartered Semiconductor Manufacturing Ltd in Singapore as a Quality and Reliability Section Manager. In Apr 1997, he joined the Nanyang Technological University as a lecturer in the School of Electrical and Electronic Engineering, teaching final year and master year students on IC reliability and failure analysis. He is now an Associate Professor in the same University.

His current research areas are mainly quality and reliability related. They are Reliability statistics, Reliability Physics and Test Methodology, and Quality Engineering such as QFD. He also works on Silicon-On-Insulator Structure Fabrication Technology.

He has more than 150 profession publications as of Dec 2007. He is also invited to write a book on Interconnect reliability to be published by the World Scientific Publisher, USA.

He is active in providing consultation to many MNC in reliability and maintainability. Some companies that he has provided consultation are IBM, Motorola, Olympus, Infineon, Philips etc.
Administrative Details

Programme Logistics

**Duration:** 3 day(s), 9am - 5pm  
**Date:** 02 - 04 Jul 19  
**Venue:** Dream Catcher Consulting Sdn Bhd, Penang

Morning break, lunch and tea break will be provided throughout the course duration. Course Manual and Certificate of Attendance will be provided.

**Your Investment**

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<tr>
<th>Type</th>
<th>Condition</th>
<th>Price per Pax</th>
<th>SST (6%)</th>
<th>Price per Pax incl SST</th>
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<tr>
<td>Regular Fee</td>
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<td>RM3,640.00</td>
<td>RM218.40</td>
<td>RM3,858.40</td>
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<td>Early Bird Discount</td>
<td>for registration before 04-Jun-2019. N/A for SBL KHAS</td>
<td>RM3,310.00</td>
<td>RM198.60</td>
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<td>Group Discount</td>
<td>for every 3 pax registered, receive 1 complimentary seat</td>
<td>RM3,640.00</td>
<td>RM218.40</td>
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Additional cost may incur for customization or extra material request. Course fee is 100% claimable from PSMB (SBL scheme) in accordance to PSMB guidelines.

**3 Easy Steps to Register**

- **Phone** +604 640 7111 / 7112  
- **Fax registration form** to +604 640 7110  
- **Email registration form** to register@dreamcatcher.asia
Method of Payment

Crossed cheque / bank draft made in favour of DREAM CATCHER CONSULTING SDN BHD.
Registration form
together with payment to be couriered to:

Dream Catcher Consulting Sdn Bhd
303-4-5 & 303-4-6
Block B, Krystal Point
Jln Sultan Azlan Shah
11900 Sg Nibong
Penang, Malaysia

Payment must be received no later than 10 working days before the course commences. An
undertaking may be accepted in cases where payment is delayed. However all payments must
be made before the course commences.
Closing registration date is 18-Jun-2019.

Refund and Cancellation

Fees will only be refunded in full for cancellation received in writing more than 10 working days
prior to the commencement date. Substitute attendee(s) will be accepted at no extra charge.

Disclaimer

Dream Catcher Consulting Sdn Bhd reserves the right to change the instructors, date and to
vary/cancel the programme should unavoidable circumstances arise. All effort will be taken to
inform participants of the changes. Upon sending the registration form, you are deemed to
have read and accepted the terms.

Enquiries

call us at +604 640 7111 / 7112 or email us at enquiry@dreamcatcher.asia
# Registration Form

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Practical Reliability Engineering - From Planning To Test Data Analysis And Extrapolation</th>
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*(Emails are required to ensure notification of any changes reach the participant)*

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<tr>
<th>No.</th>
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**Total Amount**

*(Emails are required to ensure notification of any changes reach the participant)*

**Submitted by:**

Company Name: ________________________________
Company Address: ________________________________
Contact Person: ___________________________ Designation: ___________________________
Dept: ___________________________ Phone: ___________________________
Email: ___________________________

*Please complete this form with an authorised signature below and fax to fax registration form to +604 640 7110 or email to email registration form to register@dreamcatcher.asia. Call us at phone +604 640 7111 / 7112 for any enquiry*

Authorised Signature: ___________________________

*Please print full name (authorised signature) if you submit via email*

Name: ___________________________ Designation: ___________________________
Dept: ___________________________ Date: ___________________________

*This registration is invalid without a signature. Payment must be made no later than 10 working days before the course commences. An undertaking may be accepted in cases where payment is delayed, however all payment must be made before the course commences. Participants who registered but did not attend will be invoiced accordingly. Fees will only be refunded in full for cancellation received in writing more than 10 working days prior to the commencement date. Substitute attendee(s) will be accepted at no extra charge.*

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Enclosed cheque/bank draft no ___________________________ made in favour of DREAM CATCHER CONSULTING SDN BHD