




2-day In-person Seminar:

# Introduction to Design of Experiments (DOE)

-  Chicago, IL
-  March 16th & 17th, 2017
-  9:00 AM to 6:00 PM



## William A. Levinson

William A. Levinson, P.E., is the principal of Levinson Productivity Systems, P.C. He is an ASQ Fellow, Certified Quality Engineer, Quality Auditor, Quality Manager, Reliability Engineer, and Six Sigma Black Belt. He is also the author of several books on quality, productivity, and management, of which the most recent is *The Expanded and Annotated My Life and Work: Henry Ford's Universal Code for World-Class Success*.

### Overview :

Hypothesis testing is the basis of everything we do in statistics, including not only DOE but also statistical process control (SPC) and acceptance sampling. These activities begin with a null hypothesis that is similar to the presumption of innocence in a criminal trial. We assume that there is no difference between the control or the experiment, that the process is in control, or that a production lot is acceptable.

We must prove beyond a quantifiable reasonable doubt (the significance level or Type I risk) that the alternate hypothesis is true instead. The alternate hypothesis is that the experiment is different than the control, the process is out of control, or the production lot must be rejected. There is also a Type II risk of not rejecting the null hypothesis when it should be rejected (similar to acquitting a guilty defendant), and this can be reduced by obtaining more data.

## Price

Price: **\$1,495.00**

(Seminar for One Delegate)

Register for 5 attendees

Price: **\$4,485.00** You Save: \$2,990.0 (40%)\*

~~\$7,475.00~~

**ENROLL**

*\*\*Please note the registration will be closed 2 days (48 Hours) prior to the date of the seminar.*



## Agenda:

### Day One

#### Lecture 1:

- Benefits of designed experiments
  - Hypothesis testing
  - Factors, levels, and interactions.
  - Basics of Randomization, blocking, and replication
  - Box and whisker plot; an excellent way to visualize data and differences between treatments
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#### Lecture 2:

- Tests for the difference in means between two or more populations.
    - t test and paired comparison t test
    - Analysis of Variance
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#### Lecture 3:

- The assumption of normality (a bell curve distribution) behind traditional statistical methods.
  - Test these assumptions as a mandatory follow-up to a designed experiment.
    - t test and paired comparison t test
    - Probability plot
    - Anderson-Darling test
  - Apply remedies and alternatives when the assumption is not met.
    - Transformations
    - Nonparametric method: Kruskal-Wallis test
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### Day Two

#### Lecture 1:

- Use two-way Analysis of Variance (ANOVA) to determine:
    - Whether both, one, or neither of two factors (e.g. pressure and temperature) has a significant effect on the outcome of an experiment
    - Whether interactions between the factors are present
  - Introduction to Factorial Designs
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#### Lecture 2:

- Understand the basis of linear regression:
    - Taylor series and why it is dangerous to extrapolate beyond the region of an experiment
  - Develop and test linear regression models of the form  $y=f(X)$
  - Perform residual analysis
  - Model building: test terms for significance, and remove unimportant ones to simplify the model.
  - Relationship between regression and ANOVA
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#### Lecture 3:

- Apply linear regression to two or more factors
  - Use the power law, and dimensional analysis, to develop physical models
  - Be aware of some pitfalls in regression, and the possible need for transformations.
    - Design outliers (points outside the region of interest that exert excessive leverage on a regression model)
    - Response outliers (responses that could have been affected by special or assignable causes, and that will unduly influence the model)
    - Multicollinearity, or dependence of one design variable on another
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### Group Participation

10%	2 Attendees to get offer
20%	3 to 6 Attendees to get offer
25%	7 to 10 Attendees to get offer
30%	10+ Attendees to get offer

### Payment Option

- 1 Credit Card: Use the Link to make Payment by Visa/Master/American Express card click on the register now link
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### Contact Information: Event Coordinator

NetZealous LLC, DBA GlobalCompliancePanel

161 Mission Falls Lane, Suite 216,

Fremont, CA 94539, USA

Toll free: +1-800-447-9407

Fax: 302 288 6884

Email: support@globalcompliancepanel.com

www.globalcompliancepanel.com

Kindly get in touch with us for any help or information.

Look forward to meeting you at the seminar

**GlobalCompliancePanel**