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# Application of Experimental Design to Simulation Modeling and Analysis

COURSE # 02-711  
YUMA PROVING GROUND, AZ  
26-29 August 2002

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**SYNOPSIS:** This workshop provides a hands-on introduction to experimental design techniques with a view toward application in simulation modeling and analysis. It is aimed at analysts and technical managers who use simulation tools to aid in decision making. Applying experimental design techniques to simulation modeling and analysis will enable these professionals to:

- Determine which input factors affect the response
- Build tables or models to characterize the response of interest
- Visualize the interaction of input factors and system responses
- Compare alternative system models or designs
- Predict input factor settings that will optimize the response of interest
- Confirm simulation results with field tests
- Efficiently validate models and simulations

Experimental design techniques provide a systematic, efficient way to achieve these goals. They are more efficient than "one-at-a-time" or "hit-and-miss" experimentation. The analysis is well structured to provide meaningful information in a concise format, often expressed through graphics. This has proven to be especially valuable for simulations that are expensive or time consuming to run.

The workshop will provide a computer-based statistical tool and a "keep-it-simple" approach so that these techniques can be applied immediately. The workshop leader and the text provide numerous examples of applications to stimulate innovative approaches to seemingly formidable problems.

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**TEXTS:** Participants will receive copies of the texts: Understanding Industrial Designed Experiments with DOE KISS Software and JMP Start Statistics with SAS' JMP IN software. They will also receive a bound Participant's Guide.

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**BIOGRAPHY:** Peter L. Knepell, Ph.D., is president of Peak Quality Services in Colorado Springs, CO. He has experience in computer-based prediction models, intelligent systems technology, and Six Sigma tools and techniques. He is particularly interested in improving processes involving development of software, application of simulation tools, automation of factories, and growth of employee skills. His past clients include: Ballistic Missile Defense Organization (formerly, SDIO), Army Material Systems Analysis Activity (AMSAA), Army Concepts Analysis Agency (CAA), Air Force Studies and Analysis Agency (AFSAA), Army Test and Evaluation Command (ATEC), the Defense Special Weapons Agency (DSWA, formerly DNA), Air Force Phillips Laboratory, the Defense Modeling & Simulation Office (DMSO), Amgen, Johnson & Johnson, General Electric, Sony and Corning.

The practical aspects of this workshop are based on Dr. Knepell's experience working with many different simulations. For example, he worked for the National Test Bed (NTB), a program established to support simulations and experiments for the Strategic Defense Initiative (SDI). While there, he directed the NTB's first study of system design alternatives using a large-scale, event-driven simulation. He applied experimental design techniques to minimize the number of simulation runs needed to complete the analysis and graphically display the results -- specifically, the number of runs was reduced from over 40,000 to less than 100. This is documented as a case study in the text, *Understanding Industrial Designed Experiments*. Dr. Knepell also co-authored the book, *Simulation Validation: A Confidence Assessment Methodology*.

A graduate of the US Air Force Academy, he received his doctorate degree in Operations Research from Cornell University. As a tenured professor at the Air Force Academy, he used simulations to inspire innovative thinking and group problem solving. Dr. Knepell is currently an adjunct professor with the George Washington University and Colorado Technical University. He is recognized as a Certified Quality Engineer (CQE) and Certified Software Quality Engineer (CSQE) by the American Society for Quality.

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**ELIGIBILITY:** Military Officers who possess OPMS Functional Area 49 (ORSA) and civilian GS -1515 analysts. A graduate degree in ORSA or ORSA-related field is preferred. This is a special offering for Yuma Proving Ground personnel. Others may attend on a space available basis.

**APPLICATION:** Personnel desiring to attend should apply via their Training Officer through the Army Training Requirements and Resources System (ATRRS), Course Code ALMC-SE 02-711.

**POINT OF CONTACT:** Point of Contact at YPG can be reached at DSN 899.6813.

**PLACE:** Training and Education Center, Bldg. 501, Yuma Proving Ground, AZ

**CLASSIFICATION:** The course is unclassified.

**FUNDING:** Travel and TDY payments for any personnel accepted into the course must be paid by the attendee's parent organization.

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**POINT OF CONTACT:** Further information may be obtained from the ORSA CEP course director at DSN 529 4249/4226, commercial (804) 765-4249/4226, or e-mail [orsacep@lee.army.mil](mailto:orsacep@lee.army.mil)

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