KNOXVILLE, TENNESSEE

Knoxville was established in 1792 and was named after Henry Knox, President Washington's War Secretary. It is headquarters of The Tennessee Valley Authority. The Sunsphere was built for the 1982 World's Fair.

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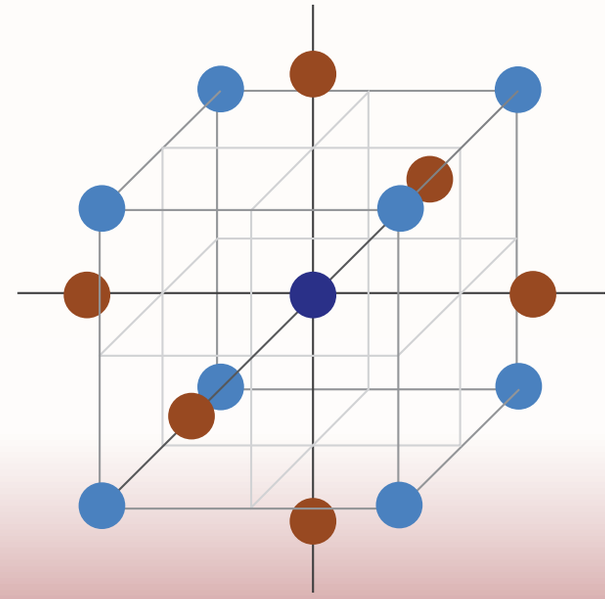


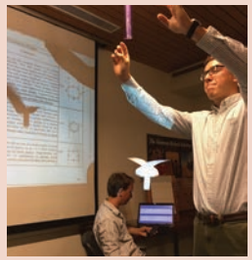
Design of Exepriments for Rapid Innovation

March 7-9, 2023

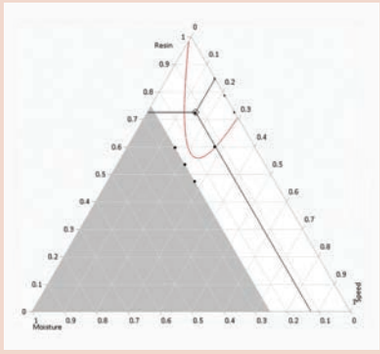
THE UNIVERSITY of TENNESSEE
INSTITUTE of AGRICULTURE
AgResearch

DESIGN OF EXPERIMENTS

Design of Experiments (DOE) refers to a process of planning an experiment so that appropriate data can be analyzed using statistical methods resulting in valid and objective conclusions. A designed experiment is a series of tests in which purposeful changes are made to input variables of a process or lab system so that we may observe and identify the objective reasons for changes in an output response. DOE facilitates the development of innovative robust products and/or processes. The fundamental principles of replication, randomization, and blocking are taught. Emphasis is given to minimizing the influence of "nuisance" factors during individual experimentation. The split-plot and nested designs for restrictions on randomization are important concepts for DOE in manufacturing settings.



DESIGNING ROBUST PRODUCTS



A key challenge for businesses is to develop and sustain competitiveness by providing innovative and robust products. DOE provides a highly accepted set of statistical methods and experimentation protocols to enhance scientific inference, improve decision making, and minimize business risk. DOE allows for the study of interaction effects of input factors which is not possible using the OFAT method or "one variable at time" experimentation. OFAT provides less information and results in more experimental runs or cost. Key methods taught for designing innovative and robust products are: split-plot and nested designs when randomization is restricted; response surface designs with and without blocking; mixture designs; and Taguchi robust product design.

INSTRUCTOR

Timothy M. Young, Phd
Professor | Graduate Director
PhD NR (Statistics) The University of Tennessee
MS Statistics, (Oper. Res.) The University of Tennessee
MS Forest Economics (Statistics), University of Wisconsin
BS Forestry, University of Wisconsin

Memberships & Honors:

American Statistical Association
American Society of Quality
Forest Product Society (Past-President)
Fulbright Scholar (Austria 2013-2014)
Fulbright Specialist – Agricultural Statistics (Austria 2016)

Tim has 20 years of experience in the bio-based products industries with four years of experience with private sector in MDF manufacture. The Design of Experiments (DOE) course has been taught successfully since 2009. More than 20 companies have participated graduating more than 130 successful candidates through the course. The course has been taught off-site, privately for four companies.

KEY CONCEPTS TAUGHT

- MODERN DESIGN CONCEPTS INCLUDING KEY PRINCIPLES AND ASSUMPTIONS
- ANOVA AND THE GLM
- FULL FACTORIAL DESIGNS
- ANCOVA
- 2K SCREENING DESIGNS
- SAMPLE SIZE AND POWER
- FRACTIONAL FACTORIALS AND PRINCIPLE OF ORTHOGONALITY
- RANDOMIZED COMPLETED BLOCK DESIGN
- SPLIT-PLOT AND NESTED DESIGNS
- BLOCKING AND CONFOUNDING WITH FRACTIONAL FACTORIALS
- RESPONSE SURFACE DESIGNS
  - CENTRAL COMPOSITE DESIGN (CCD)
  - BOX-BEHNKEN DESIGN
- MIXTURE DESIGNS AND EXTREME VERTICES DESIGNS
  - SIMPLEX LATTICE
  - AUGMENTED AND UNAUGMENTED

COURSE DESCRIPTION

The Center for Renewable Carbon (CRC) at the University of Tennessee holds training course which provides a comprehensive overview of the principles of designed experimentation for modern application in R&D experiments, product innovation and process innovation; with applications for the technical lab progressing to the manufacturing plant floor. Designing robust products is a key learning outcome of the course. Candidates participate in hands on activities and work on PC-based exercises using real world process data (JMP 16 and Minitab 20 software). The course has easy to understand text which helps ensure a comfortable pace and fun learning experience benefiting the participants. The CRC offers this program to maintain a focus of providing and leading practical education for the industrial sector.

The course requires no prior knowledge of designed experimentations. Knowledge of basic statistics and PC/ laptop usage is helpful. The course is taught in two Sessions

with **Session I** to be held on March 7-9, 2023.

DESIGNED FOR

- *Technical Directors*
- *R&D Managers*
- *Quality Control Managers*
- *Product Innovation Engineers*
- *Continuous Improvement Specialists and Engineers*