CBE 488/588 (2 Cr.) – Applied Design of Experiments for the Chemical Industry

Spring Semester 2018
Department of Chemical and Biological Engineering
South Dakota School of Mines and Technology
2018.04.02

COURSE SYLLABUS

Instructor: Travis Walker
Email: travis.walker@sdsmt.edu
Phone: 605.394.2543
Office: CBEC 3310

Dates:

Pre-lectures [CB 106]
- 2018.03.23 1600-1800

Course [CBEC 212]
- 2018.04.06 1600-2100
- 2018.04.07 0800-1600
- 2018.04.20 1600-2100
- 2018.04.21 0800-1600

Course Description: CBE 488/588 Applied Design of Experiments for the Chemical Industry
Credits: (2-0) 2
An introduction to the engineering concepts of statistics and design of experiments as applied to chemical and biological engineering problems. Includes setup and experiments for product development or for process trials. Includes critical analysis of results of an experimental design project. The course is held during a time period that will accommodate class members and industrial speakers.

Course Website:
`https://webpages.sdsmt.edu/~twalker/secure/teaching/2018/2018_01/cbe488_588.html`

Required Textbook:

M.J. Anderson and P.J. Whitcomb. *DOE Simplified: Practical Tools for Effective Experimentation*, 2nd ed., Productivity Press (2007).

Recommended Textbook:

D.C. Montgomery. *Design and Analysis of Experiments*, 8th ed., Wiley (2012).
R.H. Myers and D.C. Montgomery. *Response Surface Methodology*, 2nd ed., Wiley (2002).

Course Outcomes: By the end of the course, a student will be able to do the following:

- understand the motivation for design of experiments and factorial designs;
- demonstrate the setup of basic a factorial design;
- be able to show at a beginning level how to interpret results from an experimental design;
- have a basic knowledge of what advanced DOE tools are available to the industry, and why one might consider their use; and
- be able to demonstrate the basic application of a 2-factorial design by successfully completing practical laboratory exercises.

Tentative Course Outline (2018.04.02): This tentative list is subject to change depending on class needs. All topics may not be covered, and some topics may be covered to a greater depth than others.

1. Basic statistics
2. Introduction to experiment design
3. Implement toe DOE planning process
4. Augment low-resolution designs
5. Interpret analysis of variance (ANOVA)
6. Discover hidden interactions
7. Exploit efficient fractional designs
8. Screen variables to find the vital few, even in the presence of active interactions
9. Explore categorical factors with general factorials
10. Utilize software to practice designing and analyzing experiments

Academic Integrity: Students are expected to abide by the SDSM&T policies of academic integrity (with regard to cheating, plagiarism, etc.), as outlined in the Course Catalog.

ADA Statement: *Students with special needs or requiring special accommodations should contact the instructor, (Travis Walker, at travis.walker@sdsmt.edu or 605.394.2543) and/or the Director of Counseling and Disability Services, Ms. Megan Reder-Schopp, at megan.reder-schopp@sdsmt.edu or 394-6988 at the earliest opportunity.*

Freedom in Learning Statement: *Under Board of Regents and University policy student academic performance may be evaluated solely on an academic basis, not on opinions or conduct in matters unrelated to academic standards. Students should be free to take reasoned exception to the data or views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled. Students who believe that an academic evaluation reflects prejudiced or capricious consideration of student opinions or conduct unrelated to academic standards should contact the Provost and Vice President for Academic Affairs to initiate a review of the evaluation.*

Additional Support

- The Student Success Center is a hub for learning support, resources, and help in identifying sources of assistance or support on campus. Go to `http://www.sdsmt.edu/Academics/Student-Success-Center/` for more information or stop by the office in the Surbeck Center (across from the Dean of Students office) to visit with Lisa.Carlson@sdsmt.edu or Tyg.Long@sdsmt.edu. The phone number is 605.394.5261.

- Student Resource List:
  `http://www.sdsmt.edu/Campus-Life/Student-Resources/Student-Resources-List/`

- Information about how to use or access ITS resources (e.g., computer, Internet, email):
  `http://www.sdsmt.edu/Campus-Services/ITS/How-Do-I/`

- Title IX of the Educational Amendments Act of 1972 is the federal law prohibiting discrimination based on sex under any education program and/or activity operated by an institution receiving and/or benefiting from federal financial assistance. Behaviors that can be considered "sexual discrimination" include sexual assault, sexual harassment, stalking, relationship abuse (dating violence and domestic violence), sexual misconduct, and gender discrimination. You are encouraged to report these behaviors. Reporting: SD Mines can better support students in trouble if we know about what is happening. Reporting also helps us to identify patterns that might arise – for example, if more than one complainant reports having been assaulted or harassed by the same individual.

  SDSM&T is committed to providing a safe and positive learning experience. To report a violation of sexual misconduct or gender discrimination, please contact the Title IX Coordinator at 605-394-1203. Please note that as your professor, I am required to report any incidences to the Title IX Coordinator. Confidential support for students is available by contacting the Student Counseling Center at 605.394.1924.