Stat-712 **Theory of Experimental Design** Winter 2018-2019

Instructor: Muhammad Yaseen, PhD (Statistics, UNL-USA)

Email: myaseen208@gmail.com

Course Website: All course documents will be available only through the course website (https://myaseen208.netlify.com/teaching/) and/or LMS of UAF.

Office Hours: Monday, 09:00 – 10:00 AM

Learning Objectives: To train students through innovative instruction in design theory and methodology that will help them in addressing the significance of experimental design in Statistics and across the universal disciplines.

Contents: **Block Designs**: Introduction, Balanced Incomplete Block Designs (BIBD), Intra-Block Model, Least Squares Analysis, Estimability, Analysis of Variance, Intra-Block Analysis of a BIBD, Connectedness, Orthogonality; **Cyclic Designs**: Introduction, Efficiency factors of Cyclic Designs, Construction of Efficient Designs, n-Cyclic Designs, Generalized Cyclic Designs; **Resolvable Block Designs**: Introduction, Square Lattice Designs, Rectangular Lattice Designs, α-Designs, Latinized Block Designs, Two-Replicate Designs; **Row-Column Designs**: Model and Information Matrix, Latin Square Designs, Row-Orthogonal Designs, Non-Orthogonal Row-Column Designs; **Recovery of Inter-Block Information**: Orthogonal Block Structure, Generalized Least Squares Analysis; **Factorial Experiments**: Introduction, Single Replicate and Fractional Factorials; Response Surface Methodology; Design Optimality Criteria; Mathematical and Computer-Aided Design Theory.

Texts: John, J.A. and E.R. Williams. 2013. *Cyclic and Computer Generated Designs*. Chapman and Hall/CRC, Florida, USA.

Other References: Cox, D.R. and N. Reid. 2006. *The Theory of the Design of Experiments*. Chapman & Hall/CRC, Florida, USA.

Giesbrecht, F.G. and M.L. Gumpertz. 2004. *Planning, Construction, and Statistical Analysis of Comparative Experiments*. John Wiley & Sons, New York, USA.

Lawson, J. 2014. *Design and Analysis of Experiments with R*. Chapman and Hall/CRC, Florida, USA.

Mead, R., S.G. Gilmour and A. Mead. 2012. *Statistical Principles for the Design of Experiments: Applications to Real Experiments*. Cambridge University Press, New York, USA.

Academic Honesty: You are encouraged to work together on homework, but the work you turn in must be your own (unless the assignment specifically states otherwise). Work on exams must be your own. Any act of academic dishonesty will result in a score of zero on the item in question and notification of department and university officials. Further action may be taken as warranted.

Homework: Homework will be assigned throughout the semester and will give the student an opportunity to test his/her understanding of the material. Approximately 10 homework assignments will be made over the course of the semester. You will always have at least one week to complete them. The only way to learn statistics is to practice working problems, and homework are, therefore, essential parts of the course. **Only use A4 size paper for your work. No late homework will be accepted.**

In-Class Activities: Critical thinking is an integral component of the course. To help you develop your critical thinking skills and better understand some of the ideas presented this semester, you will be asked to do some in-class writing assignments. These writing assignments may include minute essays, a summary of the lecture, or others. Because these writing activities are designed to assist in your learning, rather than to demonstrate what you have learned, these assignments will be graded on a participation basis.

Peer Review: During the semester you will be asked to read and respond to the work of other students. This may include small writing assignments and homework. You will be graded on participation and the level of seriousness with which you approach the task (i.e., giving reasonable, appropriate feedback).

Final Project: There will be a final project in this course. The project will be of your own choice but it must be approved by the instructor.

Exams: Exams will stress understanding and ability to apply the concepts. The final exam will be comprehensive. All students will be expected to take the exams on the announced dates. **Make-up exams will not be given**.

How to be successful in the course? To be successful in this course, I strongly suggest that you should:

- Understand all the material in the course
- Complete all homework
- Read the corresponding sections of the textbook and reference books as we cover the course material
- Understand all computer codes and calculations

Disclaimer: Information contained in this syllabus was, to the best knowledge of the instructor, considered correct and complete when distributed at the beginning of the term. However, this syllabus should not be considered a contract between UAF and any student. The instructor reserves the right, acting within the policies and procedure of UAF, to make changes in course content or instructional technique without notice or obligation.