Experimental Basis for Chemical Engineers
ECH 6843
Class Periods: MWF 3:00 – 3:50 pm
Location: **CHE 0316**

Academic Term: Spring 2022

Instructor

Sumant S. Patankar
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392-0862
Office Hours: WF 2-3 pm, CHE 223 or zoom

Teaching Assistant/Peer Mentor/Supervised Teaching Student

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Course Description

(3 credits) Statistical design of experiments and treatment of data, including regression analysis, interpolation, and integration.

Course Pre-Requisites / Co-Requisites

N/A

Course Objectives

Process engineers often find themselves in situations where they are asked to deliver a process or product which meets certain specifications. Whenever we hear or read statements such as "Guaranteed to last for 5 years" or "This soda contains only 100 calories per 12 oz of serving", there is always an experiment and data analysis exercise hidden in the background which certifies these claims or hypotheses. If you are interested in the world of statistical data inference, hypothesis testing and the theory of designing experiments, then this is the right class for you. By the end of this course, students will be able to:

- Understand the different approaches to experimental design based on the end goals;
- Build a foundation for the statistical theory and statistical analysis for experimental design;
- Build appropriate statistical models for designed experiments, perform data analysis using python, and communicate results through use of statistical jargon; and
- Construct appropriate experimental designs for given problems: sample size determination, choice of levels of variables, designs with randomization.

Materials and Supply Fees

N/A

Required Textbooks and Software

Design and Analysis of Experiments, 10th Edition
Douglas C. Montgomery
June 2019
ISBN: 978-1-119-49244-3

Software: Python, associated packages

Recommended Materials

N/A

Course Schedule

Week 1: Introduction and Python Basics
Week 2: Pandas and Data visualization
Week 3: Probability distribution functions and Confidence Intervals
Week 4: Hypothesis Testing with Python
Week 5: Process Matching: Simple Comparative experiments
Week 6: Process Matching: Paired test approach
Week 7: Mid Term 1 /and Introduction to Analysis of Variance (ANOVA)
Week 8: Statistical comparison of multiple processes with Analysis of Variance ANOVA
Week 9: Process optimization using Analysis of Variance ANOVA
Week 10: Mid Term 2 and Introduction to Random designs/Blocking
Week 11: Analyzing process data Random designs/Blocking
Week 12: Factorial designs – process modelling and interpolation
Week 13: JMP : Basics, data processing and plotting
Week 14: JMP : Performing Statistical Analysis (simple comparative experiments / ANOVA)
Week 15: Review / Final Exam

Attendance Policy, Class Expectations, and Make-Up Policy

Excused absences must be in compliance with university policies in the Graduate Catalog (http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance) and require appropriate documentation.

Evaluation of Grades

Grades will be based on attendance, participation, weekly assignments, two midterm tests and a final exam. Weekly assignments must be submitted online before class time on the date they are due.

Assignment	Percentage of Final Grade
Homework Assignments	30%
Midterm Exams	40%
Final Exam	30%

Grading Policy

Percent	Grade	Grade points
90.0 - 100	A	4.00
87.0 – 89.9	A-	3.67
84.0 - 86.9	B+	3.33
81.0 - 83.9	B	3.00
78.0 - 80.9	B-	2.67
75.0 - 77.9	C+	2.33
72.0 - 74.9	C	2.00
69.0 - 71.9	C-	1.67
66.0 - 68.9	D+	1.33
63.0 - 65.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:
http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center (352-392-8565,

https://www.dso.ufl.edu/drc). It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/.

Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

University Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code." On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied:

On my honor, I have neither given nor received unauthorized aid in doing this assignment.

The Honor Code (https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see:
http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html

Campus Resources:

Health and Wellness

U Matter, We Care:
If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.

Counseling and Wellness Center: http://www.counseling.ufl.edu/cwc, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. https://www.crc.ufl.edu/.

Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/.

Student Complaints Campus*:* https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf

On-Line Students Complaints*:* http://www.distance.ufl.edu/student-complaint-process.