CSUB, Department of Mathematics

Math 4220 Design and Analysis of Experiments Course Syllabus

Spring 2021

Instructor

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Office: Science III 205 (Not used Spring 2012)
Office Hours (Zoom): Monday: 2:30pm-5:00pm
Tuesday: 2:45pm-4:15pm
Wednesday: 10:00am-11:00am or by appointments
URL:https://csub.zoom.us/j/2211220669?pwd=dUJSSzVRa1ZQRHFSK2YzYjNrMGJrdz09

Lectures & SA Lectures will be delivered by an uploaded video which you can watch on your own time and pace; the links for the videos are given in the schedule on page 5. During student activity (SA) days, we will be using the statistical program SAS to practice analyzing data and solving problems based on the materials learned in lectures. You are recommended to read the corresponding sections on the textbook and watch the corresponding lecture videos before the SA days. You are also required to participate in the SA zoom meetings and stay for the entire class period. You will not receive credit for SA assignment if you miss the SA day or leave early. Late assignments will not be accepted. These meetings will not be recorded. See page 5 for a full schedule with all the zoom meeting days highlighted.

Textbook ***Design and Analysis of Experiments***, 8rd edition, by Montgomery

Reference Design and Analysis of Experiments with SAS, by John Lawson

Prerequisites Math 2200 or Math 4200
Math 140 or Math 440 (Quarter course prerequisite)

Description This is a 4-unit introductory course dealing with the design of statistically valid experiments and the analysis of resulting data. Both the theoretical foundations of experimental design and their application to scientific and industrial experimentation will be explored. The design and analysis of experiments is one of the most important and useful branches of modern statistics. In this course, we will learn sample comparative experiments, one-way ANOVA, two-way ANOVA, complete randomized blocks design, incompletely randomized design, Latin squares, factorial designs, the 2^k factorial design, experiments with random factors, nested and split-plot designs. In addition, you will gain some experience with performing design of experiments in a popular statistical software SAS. Tentatively, we will cover Chapters 1, 2, 3, 4, 5, 6, 7, 13 and 14. If time permitted, topics from either Chapter 10 or 15 can be selected.

Objective The objective of the course is for students to develop the skills necessary to efficiently and effectively plan, design and conduct experiments. By the end of the semester, students should understand various fundamental concepts in analysis of variance and design of experiments; understand the underlying principles of experimental design; carry out the analysis of experimental designs and appropriate multiple comparisons; understand the reasoning behind the use of blocking, Latin squares, and other designs; learn about how to

apply analysis of variance to a real world application; perform the methods using statistical programming software SAS, interpret the model outputs and write a formal scientific report.

Computing

In this course, we will be using the statistical program SAS (Statistical Analysis System) to design and analyze experiment under various settings. Why are we using SAS? SAS is one of the best known and most widely used statistical packages in the world. SAS/STAT for statistical analysis are the extensive, leading techniques for data analysis, statistical inference and statistical modeling. Google and Facebook, for example, both use SAS to do a large amount of their data analysis. In addition to learning different concepts and methods in design and analysis of experiments that will be a valuable skill to any quantitative field, knowledge of SAS for experimental design and analysis will provide you with a job skill for today's data centric world. If you Google "SAS jobs", you'll discover that knowing SAS is a competitive advantage for a lot of jobs these days. The effort to learn these programs in this course will be well worth your while.

Course Webpage

Important information about the course will be available on the course webpage: http://www.csub.edu/~bzeng/4220/math4220.shtml Information you can find on this site includes: syllabus, announcements, homework assignments, activities, handouts and other information. Please check the course webpage regularly as it will be updated continuously throughout the semester.

Homework/SA

There will be problem sets assigned every week. Homework problems will be the combinations of some selected textbook exercises and a few problems that are not from the textbook. Homework/SA are all available now on the course website and gradescope. Homework solutions submitted for grading should be legible and neat. Some collaboration on homework/SA is acceptable. If you do work with others, you must list your collaborators on the paper you hand in. The work you hand in must be your own.

All the assignments are due by 8:30am on gradescope. Please see the full schedule on page 5 for the deadlines of each homework/SA. **Late homework/SA will not be accepted and will receive a score of zero unless there is a documented medical emergency.**

Homework/SA assignments must be submitted as a scanned pdf to Gradescope. No email submission is accepted. You should have already received an e-mail with registration information for Gradescope. The entry code for this course is: 86NRRW. There are several options for scanning your work.

- On IOS devices (iphone/ipads), download the app Scannable by Evernot in the app store for free high quality scans.
- On android devices, download the app Genius Scan in the google play store for free high quality scans.
- Any other method that produces a PDF is acceptable.

Please be sure to select which page (or which pages) each problem appears with your submission. It is OK to have more than one problem on a page, and is also OK to have a problem take up more than one page. Because you are selecting the pages, it is not necessary to do the problems in order.

Class Project

You will be required to conduct a team project for this course. Class project teams should consist of three to four people. Your team will need to provide me with a typed project proposal no later than April 5th. I will review your proposal and get back to you with changes by April 7th. Your team will hand in one copy of the completed project write-up which is due on May 12th. Your team is also required to make a presentation about your project on May 12th. More details about the project write-up and presentation guidelines will be furnished in a separate document.

Exam

There will be two exams and a final. The exams are scheduled on March 8th and April 21th. The final is scheduled on Monday May 17th from 11:00am-1:30pm. In this course, the exams and the final will either be in-class, take-home assignments, or combination of both. The take-home exams will typically have a few or several data sets described; you will be asked to analyze the data sets and write several pages describing what you did. The in-class exams will be closed book, but you may bring one sheet of handwritten notes to the midterm exams and two sheets to the final exam. You will also need a calculator for the exams. *All work on exams must be entirely your own and academic dishonesty will not be tolerated.* **There will be no make up exams or final unless there is a documented medical emergency.** It is just as dishonest to give help as to receive it.

The topics on each exam are as follows:
Exam 1: Chapters 1-3
Exam 2: Chapters 4-6
Final Exam: Chapters 1-7,13

Grading Policy

Weighting Scheme			Scale:
HW & SA	30%	A	90-100%
Exams 1	20%	B	80-89%
Exam 2	20%	C	70-79%
Final	20%	D	60-69%
Project	10%	F	0-59%

Note that plus and minuses will be given.

Webcam

Because nonverbal feedback is helpful in human interactions, I expect students in this class to keep their cameras on during synchronous portions of online instruction. With this in mind, please plan where you will be during class time so you can participate in a setting that is free from visual distractions. If you believe you have a legitimate reason not to have your camera turned on, please consult with me well in advance of the class period, and I will make a determination. Here is the zoom link again for this semester: https://csub.zoom.us/j/2211220669?pwd=dUJSSzVRa1ZQRHFSK2YzYjNrMGJrdz09

Disabled Student Program (DSP)

Students who need special accommodations for this course must notify the office of Services for Students with Disabilities (SSD), SADM 140, at 654-3360. SSD's website is

Academic Integrity

www.csub.edu/univservices/ssd.

Academic dishonesty includes, but is not limited to cheating, plagiarism, or sabotage. Any student caught cheating on an exam or the final will receive an F for the course. Academic dishonesty is not tolerated and will be dealt with as specified in the California State University, Bakersfield policy. This policy is located online at the following address: http://www.csub.edu/studentconduct/documents/academicintegrity.pdf.

Changes to Syllabus

I reserve the right to make changes to this syllabus. Any such changes will be announced in class.

MATH 4220 Weekly Schedule Spring 2021

Week 1: January 25th – January 29th
Lecture 0 (Syllabus Explanation): https://youtu.be/LsjKIHegcW0
Lecture 1 (Chapter 1-Introduction to DOE): https://youtu.be/W5lXcgZZHUM
Student Activity 1 (Lecture 1): Wednesday January 27th at 12pm via Zoom

Week 2: February 1st – February 5th
SA 1 (Lecture 1): Due on gradescope Feb 3rd by 8:30 AM
Lecture 2 (Chapter 2-One Sample Test): https://youtu.be/vs7ALt3X1R8
Lecture 3 (Chapter 2-Two Sample Test): https://youtu.be/09yLwgyyk4k

Week 3: February 8th – February 12th
Student Activity 2 (Lecture 2,3): Monday February 8th at 12pm via Zoom
Lecture 4 (Chapter 3-ANOVA Table): https://youtu.be/D_xOQefXzrY

Week 4: February 15th – February 19th
SA 2 (Lecture 2,3): Due on gradescope Feb 15th by 8:30 AM
HW 1 (Lecture 1,2,3): Due on gradescope Feb 15th by 8:30 AM
Lecture 5 (Chapter 3-ANOVA Table & SA3 Instruction): https://youtu.be/fmGdB9xnwok
Lecture 6 (Chapter 3-Contrast): https://youtu.be/qTACQ6AiSiI

Week 5: February 22th – February 26th
HW 2 (Lecture 4,5): Due on gradescope Feb 22th by 8:30 AM
Lecture 7 (Chapter 3-Contrast & SA4 Instruction): https://youtu.be/KhlY3b99zyQ
Student Activity 3 (Lecture 4,5,6,7): Wednesday February 24th at 12pm via Zoom

Week 6: March 1st – March 5th
Lecture 8 (Chapter 3-Sample Size,Random Factor,SA5 Instruction):
https://youtu.be/OIys3_DvCAA
SA 3 (Lecture 4,5,6,7): Due on gradescope March 3rd by 8:30 AM
HW 3 (Lecture 6,7,8): Due on gradescope March 3rd by 8:30 AM
Exam 1 Review (Chapter 1,2,3): Wednesday March 3rd at 12pm via Zoom

Week 7: March 8th – March 12th
Exam 1: March 8th, 12-1:40 PM.
Lecture 9 (Chapter 4- RCBD & SA6 Instruction): https://youtu.be/ZmmKMYX325E

Week 8: March 15th – March 19th
Lecture 10 (Chapter 4-Latin Squares & SA6 Instruction): https://youtu.be/sLYOCHp4O98
Student Activity 6 (Lecture 9, 10): Wednesday March 17th at 12pm via Zoom

Week 9: March 22th – March 26th
HW 4 (Lecture 9, 10): Due on gradescope March 22th by 8:30 AM
Project Discussion: Monday March 22th at 12pm via Zoom
SA 6 (Lecture 9, 10): Due on gradescope March 24th by 8:30 AM
Lecture 11 (Chapter 4-BIBD&RandomBlocks&SA7 Instruction): https://youtu.be/kLzs-Zi2KQk

Week 10: March 29th – April 2nd
The Week of Spring Break. No class.

Week 11: April 5th – April 9th
Project Proposal: Due by April 5th by 12pm via email
HW 5 (Lecture 11): Due on gradescope April 7th by 8:30 AM
Lecture 12 (Chapter 5-Two-way ANOVA & Contrast): https://youtu.be/C5io0Mg8zM4
Lecture 13 (Chapter 5-Threeway ANOVA&SA8 Instruction): https://youtu.be/n-Fz1Q8Fpm4

Week 12: April 12th – April 16th
Lecture 14 (Chapter 6-Factorial Design): https://youtu.be/s9SN-5VCAso
Student Activity 8 (Lecture 12, 13, 14): Wednesday April 14th at 12pm via Zoom

Week 13: April 19th – April 23th
HW 6 (Lecture 12, 13, 14): Due on gradescope April 19th by 8:30 AM
Exam 2 Review (Chapter 4,5,6): Monday April 19rd at 12pm via Zoom
SA 8 (Lecture 12, 13, 14): Due on gradescope April 21th by 8:30 AM
Exam 2: April 21th, 12-1:40 PM.

Week 14: April 26th – April 30th
Lecture 15 (Chapter 7-Blocking and Confounding): https://youtu.be/vaFyALIQ8dE
Student Activity 9 (Lecture 15): Wednesday April 28th at 12pm via Zoom

Week 15: May 3rd – May 7th
Lecture 16 (Chapter 13-Random Effect Model): https://youtu.be/nNoYjhg8tRM
SA 9 (Lecture 15): Due on gradescope May 5th by 8:30 AM
Student Activity 10 (Lecture 16): Wednesday May 5th at 12pm via Zoom

Week 16: May 10th – May 14th

Group Project Time: Monday May 10th at 12pm via Zoom

SA 10 (Lecture 16): Due on gradescope May 12th by 8:30 AM

HW 7 (Lecture 15,16): Due on gradescope May 12th by 8:30 AM

Group Presentation: Wednesday May 12th at 12pm via Zoom

Final Exam: Monday May 17th, 11:00 AM- 1:30 PM