North Central State College

MASTER SYLLABUS	2025-2026

A. Academic Division: Engineering Technology, Business & Criminal Justice Division

B. Discipline: Mechanical Engineering

C. Course Number and Title: ENGR 4210 Design of Engineering Experiments

D. Assistant Dean: Brooke Miller, M.B.A.

E. Credit Hours: 3

F. Prerequisites: MATH1151

G. Last Course/Curriculum Revision Date: Fall 2025 Origin date: 09/19/2018

H. Textbook(s) Title:

Introduction to the Design & Analysis of Experiments

- Authors: Canavos, Koutrouvelis
- Copyright Year: 2009
- Edition: 1st Edition
- ISBN: 9780136158639

I. Workbook(s) and/or Lab Manual: None; Class Handouts will be distributed

J. Course Description: This course prepares students to analyze statistically designed experiments and their importance in data analysis, industrial experiments, role of randomization, fixed and random effect models and ANOVA, block design, Latin square design, factorial and fractional factorial designs and their analysis.

K. College-Wide Learning Outcomes:

College-Wide Learning Outcome	Assessments - - How it is met & When it is met
Communication – Written	
Communication – Speech	
Intercultural Knowledge and Competence	
Critical Thinking	
Information Literacy	
Quantitative Literacy	

L. Course Outcomes and Assessment Methods:

Upon successful completion of this course, the student shall:

Outcomes	Assessments – How it is met & When it is met
1. Definition of an experiment	Report, quiz, midterm, final
2. Design of experiments statistical problem solving and analysis	Quiz, midterm
3. Use of Minitab software	Lab work, quiz and midterm, final
4. Design an experiment	Quiz, report
5. Perform a factorial analysis	Quiz, midterm, and final
6. Perform an ANOVA analysis	Quiz, midterm, and final
7. Perform a Weibull analysis	Midterm and final exam
8. Perform a Taguchi analysis	Midterm and final

ABET Outcomes:

- *Outcome b.* Use of computer aided drafting and design software;
- *Outcome c.* Perform selection, set-up, and calibration of measurement tools/instrumentation;
- *Outcome k.* Application of industry codes, specifications and standards;
- *Outcome l.* Technical communication typically used in preparation of engineering proposals, reports, and specification.

M. Recommended Grading Scale:

NUMERIC	GRADE	POINTS	DEFINITION
93–100	A	4.00	Superior
90–92	A-	3.67	Superior
87–89	B+	3.33	Above Average
83–86	B	3.00	Above Average
80–82	B-	2.67	Above Average
77–79	C+	2.33	Average
73–76	C	2.00	Average
70-72	C-	1.67	Below Average
67–69	D+	1.33	Below Average
63-66	D	1.00	Below Average
60-62	D-	0.67	Poor
00--59	F	0.00	Failure

N. College Procedures/Policies:

North Central State College believes that every student is a valued and equal member of the community.* Every student brings different experiences to the College, and all are important in enriching academic life and developing greater understanding and appreciation of one another. Therefore, NC State College creates an inclusive culture in which students feel comfortable sharing their experiences. Discrimination and prejudice have no place on the campus, and the College takes any complaint in this regard seriously. Students encountering aspects of the instruction that result in barriers to their sense of being included and respected should contact the instructor, assistant dean, or dean without fear of reprisal.

* *Inclusive of race, color, religion, gender, gender identity or expression, national origin (ancestry), military status (past, present or future), disability, age (40 years or older), status as a parent during pregnancy and immediately after the birth of a child, status as a parent of a young child, status as a foster parent, genetic information, or sexual orientation*

Important information regarding College Procedures and Policies can be found on the syllabus supplement located at
https://ncstatecollege.edu/documents/President/PoliciesProcedures/PolicyManual/Final%20PDFs/14-081b.pdf

North Central State College

SYLLABUS ADDENDUM

Academic Division:	Engineering Technology, Business and Criminal Justice Division	**Discipline:**	Mechanical Engineering Technology
Course Coordinator:			
Course Number:	ENGR-4210-30	**Course Title:**	Design of Engineer Experiments
Semester / Session:	Spring 2026 / Full Semester	**Start / End Date:**	01/12/2026 – 05/08/2026

Instructor Information

Name:	Md Saiful Islam	**Credentials:**	Ph.D. in Geological Sciences, M.S. in Petroleum Engineering, and B.S. in Mechanical Engineering
Phone Number:	419-755-4717	**E-Mail Address:**	sislam@ncstatecollege.edu
Office Location:	Kehoe 234	**Office Hours:**	Tuesday & Thursday: 10:00 AM - 12:30 PM

I. Topical Timeline (Subject to Change):

Weeks	Topics	Assignment	Due Date
1	Introduction to Design of Experiment (DOE)	Quiz-1	01/30/2026
2-3	Investigating a single factor: Completely & randomized, Incomplete block & Latin square		
4-5	Factorial Experiments: Completely Randomized Designs, Randomized Block & Latin Square Designs	Quiz-2/Home Work	02/13/2026
6	Nested Factorial Experiments & Repeated Measures Designs	Quiz-3	02/27/2026
7	2^F and 3^F factorial experiments		
8	Contents covered in Weeks 1 to 7	Midterm Exam	03/06/2026
9	Spring Break - No Class		03/09/2026 – 03/13/2026
10	Confounding in 2^F and 3^F designs	Quiz-4/Home Work	04/10/2026
11	Fractional factorial experiments		
12-13	Regression analysis: General linear model, 1st & 2nd order response surface models	Quiz-5	04/24/2026
14-15	Response surface design for 1st and 2nd order models		
16	Review		
17	**Final Exam**		05/08/2026
NOTE: This is a tentative schedule. Assignments and due dates may be changed at the discretion of the instructor.			

II. Grading and Testing Guidelines:

- Final Grade Calculation:

Activity	Qty	Points	Percentage
Quizzes/Home Works	5	500	30
Mid Term Exam	1	100	30
Final Exam	1	100	40

- College Recommended Grading Scale:

NUMERIC	GRADE	POINTS	DEFINITION
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83–86	B	3.00	Above Average
80–82	B-	2.67	Above Average
77–79	C+	2.33	Average
73–76	C	2.00	Average

70-72	C-	1.67	Below Average
67–69	D+	1.33	Below Average
63-66	D	1.00	Below Average
60-62	D-	0.67	Poor
00-59	F	0.00	Failure

III. Examination Policy:

1. The reasons for which a student will be excused from taking an examination:
   a. Hospitalization (with documented verification)
   b. Death in the immediate family (with documented verification)
   c. Personal illness or illness in immediate family - (doctor's excuse required).

2. A student who misses an examination for any reason is responsible for:
   a. Notifying the instructor before the day of the examination.
   b. Set up a new date for the examination through email from instructor.

3. No makeup opportunity will be given for absences of quizzes.

IV. Class Attendance and Homework Make-Up Policy:

Attendance is required per NCSC policy. Class Absentees: No merit or demerit derived from attendance, unless it prevents you from taking a quiz or examination. Homework value will lose 10% per day late.

V. Classroom Expectations:

1. **Questions in class:** Any questions regarding the material are welcome during the class. If something is not clear to you, it probably is not clear to others. So, ask questions. Your question not only helps yourself, but it also helps others. If your question is too specific and its answer is too long, I may invite you to ask me later in my office.

2. **Office hours:** Take the full advantage of the office hours. Any questions regarding assignments, exam reviews, or general understanding of the material are welcome. If you cannot make the scheduled office hours, appointments can be made in class or by email.

3. **Diagrams:** The importance of diagrams in this course, and generally in Design of Engineering Experiments, cannot be possibly over- emphasized. Their benefit is two-fold; a) Diagrams help you imagine a problem's scenario, so you will not leave out any details and your solution will be accurate, b) Diagrams are a good tool to represent your solution more clearly to your audience (here, a grader for example, and later to your manager/colleagues). Both a) and b) will enhance your performance as a student and as a future engineer.

4. **Assignments:** Doing the assignments is extremely important. As you will see, the concepts of Design of Engineer Experiments are very simple. Applying them to different problems, however, is challenging at least. You can master the application techniques only by practicing. So, do not neglect the assignments. The assigned homework problems are the bare minimum number required for you to consider. You must solve as many extra problems on your own as possible for best results in this course.