

COURSE IMPLEMENTATION DATE: May 1994
 COURSE REVISED IMPLEMENTATION DATE: January 2012
 COURSE TO BE REVIEWED: November 2017
(six years after UEC approval) *(month, year)*

OFFICIAL UNDERGRADUATE COURSE OUTLINE INFORMATION

Students are advised to keep course outlines in personal files for future use.
 Shaded headings are subject to change at the discretion of the department – see course syllabus available from instructor

MATH 330	SCIENCE/MATH & STATS	3
COURSE NAME/NUMBER	FACULTY/DEPARTMENT	UFV CREDITS
Design of Experiments		
COURSE DESCRIPTIVE TITLE		

CALENDAR DESCRIPTION:

This course discusses the construction and analysis of standard experimental designs. The basic techniques of randomization and blocking and the use of covariates are reviewed, followed by consideration of the 2^k factorial and fractional factorial designs. Repeated measures designs are next discussed, including the split-plot and cross-over varieties. Variance components analysis and response surface methods are covered as time allows. Emphasis is on the conduct, assumption, implications, and rationale of particular designs. The data analysis is implemented using statistical software. Students are expected to produce a report which analyzes data collected from an experiment which they have designed and conducted, and which illustrates at least one of the major designs discussed.

PREREQUISITES: One of the following: MATH 106 with a B or better, MATH 104 with a B+ or better, MATH 270, or MATH 271

COREQUISITES:
 PRE or COREQUISITES:

SYNONYMOUS COURSE(S):

- (a) Replaces: _____
- (b) Cross-listed with: _____
- (c) Cannot take: _____ for further credit.

SERVICE COURSE TO: *(department/program)*

TOTAL HOURS PER TERM: 45

STRUCTURE OF HOURS:
 Lectures: 30 Hrs
 Seminar: _____ Hrs
 Laboratory: 15 Hrs
 Field experience: _____ Hrs
 Student directed learning: _____ Hrs
 Other (specify): _____ Hrs

TRAINING DAY-BASED INSTRUCTION:

Length of course: _____
 Hours per day: _____

OTHER:

Maximum enrolment: 36
 Expected frequency of course offerings: Every second year
(every semester, annually, every other year, etc.)

WILL TRANSFER CREDIT BE REQUESTED? (lower-level courses only)

Yes No

WILL TRANSFER CREDIT BE REQUESTED? (upper-level requested by department)

Yes No

TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE:

Yes No

Course designer(s): Ali Reza Fotouhi

Department Head: Greg Schlitt

Supporting area consultation (Pre-UEC)

Curriculum Committee chair: Norm Taylor

Dean/Associate VP: Ora Steyn

Undergraduate Education Committee (UEC) approval

Date approved: November 29, 2010

Date of meeting: October 7, 2011

Date approved: October 21, 2011

Date approved: November 4, 2011

Date of meeting: November 25, 2011

LEARNING OUTCOMES:

Upon successful completion of this course, students will be able to:

1. employ basic statistical designs commonly met in practice and in the literature;
2. explain the reasoning and importance of the basic experimental maneuvers of randomization, blocking, stratification, and replication;
3. apply the fixed effects, random effects, and mixed effects models and demonstrate the differences;
4. select a fraction of a factorial design when the performance of the full design is expensive and/or time consuming;
5. recognize the effects of measurement errors in independent variables and the notions of replicatability and reliability;
6. use a statistical software package to design and to analyze data sets;
7. design an experiment, collect the data, analyze the data, and give recommendations about the proposed research hypotheses.

METHODS: (Guest lecturers, presentations, online instruction, field trips, etc.)

Lectures, computer work, discussion both in and out of class, group work for project.

METHODS OF OBTAINING PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

Examination(s) Portfolio assessment Interview(s)

Other (specify): Course Challenge

PLAR cannot be awarded for this course for the following reason(s):

TEXTBOOKS, REFERENCES, MATERIALS: [Textbook selection varies by instructor. Examples for this course might be:]

The textbook is chosen by a departmental curriculum committee. Recent texts used:
Text: Box, G.E.P., Hunter, W.G., and Hunter, J.S. 1978. *Statistics for Experimenters*. Wiley.
References: Montgomery, D.C. 2001. *Design and Analysis of Experiments*. Wiley.
Fleiss, Joseph L. 1999. *The Design and Analysis of Clinical Experiments*. Wiley.
Crowder, M.J. and Hand. 1990. *Analysis of Repeated Measures*. Chapman and Hall.
Cox, D.R. 1957. *The Design of Experiments*. Wiley.

SUPPLIES / MATERIALS:

STUDENT EVALUATION: [An example of student evaluation for this course might be:]

Project	10%
Assignments	20%
Tests	30%
Final examination	40%

Students must obtain at least 40% on the final exam in order to pass this course.

COURSE CONTENT: [Course content varies by instructor. An example of course content might be:]

- Linearity: the assumptions of a linear model, linear effects and a linear error term. Randomisation.
- Blocking designs: matched pairs, randomised blocks, Latin squares, multiple Latin squares, Graeco-Latin squares, balanced incomplete blocks, Youden squares. Blocking versus covariate analysis: discussion.
- Factorial designs: 2^k designs. Yates' plussing and minusing, Daniels' method of plotting to select contrasts of interest in saturated designs. Fractional factorial designs, confounding and aliasing. Selecting a fractional factorial design, implications of the selection, replication. Designs of Resolution R. Plackett and Burman designs.
- Response surface methods: use and estimation of local quadratic approximations, the search for an optimum.
- Variance components: variance component models in balanced designs, construction of appropriate models, interpretation of tests, confidence intervals for fixed effects.
- Cross-over designs: conditions under which they are appropriate, analysis and interpretation.
- Split-plot designs: common repeated measure designs and corresponding uni-variate models and analysis.
- Error-in-measurement problems: replication and reliability, Cronbach's alpha, the attenuation of slope estimates.