UNIVERSITY OF THE FRASER VALLEY

OFFICIAL UNDERGRADUATE COURSE OUTLINE (page 1)

COURSE IMPLEMENTATION DATE: May 1994
COURSE REVISED IMPLEMENTATION DATE: September 2009
COURSE TO BE REVIEWED: June 2013
(four years after UPAC 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 resulting from analyzing data collected from an experiment which they have designed and conducted and which illustrates at least one of the major designs discussed.

PREREQUISITES: MATH 270 or MATH 106 with a B or better, or MATH 104 with a B+ or better.
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: 60
STRUCTURE OF HOURS:

Lectures:	60	Hrs
Seminar:		Hrs
Laboratory:		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 Fotouhi
Department Head: Greg Schlitt — Date approved: March 2, 2009
Supporting area consultation (UPACA1) — Date of meeting: March 27, 2009
Curriculum Committee chair: Greg Schlitt — Date approved: May 29, 2009
Dean/Associate VP: Dan Ryan — Date approved: June 8, 2009
Undergraduate Program Advisory Committee (UPAC) approval — Date of meeting: June 26, 2009

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.
8.

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. An example of texts for this course might be:]

The textbook is chosen by a departmental curriculum committee. Recent texts used:

Montogmery, D.C. Designand Alanysis of Experiments, 6th edition, 2005 Wiley
Box, G.E.P., Hunter, W. G., and Hunter, J.S. 2005, 2nd Edition. Statistics for Experimenters. Wiley

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:]

1. Experiments with single factor: the assumptions of a linear model, linear effects, and a linear error tem, randomization, the analysis of variance method, fixed effects model, model adequacy checking, multiple comparisons, contrasts, determining sample size, Kruskal-Wallis test for analysis of variance.
2. Blocking designs: matched pairs, randomized complete block design, Latin square design, multiple Latin squares, Graeco-Latin square design, balanced incomplete block design, Youden squares.
3. Factorial designs: the general factorial design, blocking in factorial design, 2^k factorial designs, blocking and confounding in 2^k factorial design. Yates' plussing and minussing, 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.
4. Response surface methods: use and estimation of local quadratic approximations, the search for an optimum.
5. Experiments with random factors: random effects model, mixed effects model, variance components, rules for expected mean squares, construction of appropriate models, inference and interpretation for fixed effects and variance components.
6. Cross-over designs: conditions under which they are appropriate, analysis and interpretation.
7. Nested and Split-plot designs: the two stage nested design, the general m-stage nested design, diagnostics and variance components, designs with both nested and factorial design, split-plot design.
8. Error-in-measurement problems: replication and reliability, Cronbach's alpha, the attenuation of slope estimates.