OFFICIAL UNDERGRADUATE COURSE OUTLINE (page 1)

COURSE IMPLEMENTATION DATE:	May 1994
COURSE REVISED IMPLEMENTATION DATE:	January 2013
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

STAT 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.

Note: Students with credit for MATH 330 cannot take this course for further credit.

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

COREQUISITES:

PRE or COREQUISITES:

SYNONYMOUS COURSE(S):

(a) Replaces: **MATH 330**

(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? (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	Date approved:	**March 5, 2012**
Supporting area consultation (Pre-UEC)		Date of meeting:	**March 30, 2012**
Curriculum Committee chair:	Norm Taylor	Date approved:	**April 20, 2012**
Dean/Associate VP:	Ora Steyn	Date approved:	**May 4, 2012**
Undergraduate Education Committee (UEC) approval		Date of meeting:	**May 23, 2012**

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; see PLAR policy (94) at http://ufv.ca/secretariat/policies/

☐ 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 tem. 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 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.
- 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.