



COURSE IMPLEMENTATION DATE: July 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

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| <u>MATH 420</u> | <u>Science / Mathematics & Statistics</u> | <u>3</u> |
| COURSE NAME/NUMBER | FACULTY/DEPARTMENT | UFV CREDITS |
| <u>Empirical and Non-Parametric Statistics</u> | | |
| COURSE DESCRIPTIVE TITLE | | |

CALENDAR DESCRIPTION:

When the normality assumption of the underlying distribution of data does not hold, the traditional parametric approach for constructing confidence intervals and testing hypotheses fails. In this case, the non-parametric approach can be used. This course introduces various non-parametric techniques to test parameters for location and dispersion. It deals with problems in single sample, two or more independent samples, and two or more related samples. Goodness-of-fit tests and tests of association are also discussed.

PREREQUISITES: One of the following: MATH 270, MATH 271, MATH 315, or MATH 330
 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: 40 Hrs
 Seminar: _____ Hrs
 Laboratory: 5 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 two years
(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

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|--|---|
| Course designer(s): <u>David Chu</u> | Date approved: <u>November 29, 2010</u> |
| Department Head: <u>Greg Schlitt</u> | Date of meeting: <u>October 7, 2011</u> |
| Supporting area consultation (Pre-UEC) | Date approved: <u>October 21, 2011</u> |
| Curriculum Committee chair: <u>Norm Taylor</u> | Date approved: <u>November 4, 2011</u> |
| Dean/Associate VP: <u>Ora Steyn</u> | Date of meeting: <u>November 25, 2011</u> |
| Undergraduate Education Committee (UEC) approval | |

LEARNING OUTCOMES:

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

1. test the location parameter using sign test, Wilcoxon signed ranks test, median test, Mann-Whitney test, Kruskal-Wallis test and Friedman test;
2. construct confidence intervals for location parameter based on sign test, Wilcoxon signed ranks test, median test and Mann-Whitney test;
3. use Moses' test and Ansari-Bradley test for dispersion parameter;
4. apply chi-square test, Kolmogorov-Smirnov test and Lilliefors test for goodness of fit test;
5. employ the Spearman rank correlation coefficient, Kendall's tau, chi-square test and Kendall's coefficient of concordance to test for association;
6. use one-sample runs test and Cox-Stuart test for trend;
7. apply Hollander test of extreme reactions and Fisher exact test;
8. use McNemar test for two related samples;
9. complete a group project and test a real-life data set using one of the non-parametric techniques learned in the course.

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

Lectures, class discussion and use of statistical software in computer lab.

METHODS OF OBTAINING PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

- Examination(s) Portfolio assessment Interview(s) Other (specify): Course Challenge

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

Text: Applied Nonparametric Statistics, 2nd Edition, by W. Daniel. Duxbury.

Reference: Practical Nonparametric Statistics, 3rd Edition, by W. Conover. Wiley.

SUPPLIES / MATERIALS:

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

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|-------------|-----|
| Assignments | 20% |
| Test | 20% |
| Project | 20% |
| Final exam | 40% |

The above percentages may vary among instructors and years. The final exam is comprehensive. Students must obtain at least 40% on the final exam to pass the course.

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

Test for location parameter:

- One sample---sign test, Wilcoxon signed ranks test and their associated confidence intervals.
- Two independent samples---median test, Mann-Whitney test and their associated confidence intervals.
- Two related samples---sign test, Wilcoxon matched-pairs signed ranks test and their associated confidence intervals.
- Three or more independent samples---extension of median test, Kruskal-Wallis test, multiple comparisons, Lehman contracts, comparing all treatments with a control.
- Three or more related samples---Friedman two-way analysis of variance by ranks, multiple comparisons, Durbin's test for incomplete block designs, aligned ranks.

Test for dispersion parameter:

- Two independent samples---Moses' test, Ansari-Bradley test.

Goodness-of-fit test:

- One sample---chi-square test, Kolmogorov-Smirnov test, confidence band for a population distribution function, Lilliefors test.
- Two independent samples---Kolmogorov-Smirnov test.

Test for association:

- One sample---Spearman rank correlation coefficient, Kendall's tau and its confidence interval.
- Two independent samples---chi-square test of independence.
- Three or more independent samples---Kendall's coefficient of concordance, chi-square test, partial rank correlation.

Other tests:

- One sample---binomial test, one-sample runs test, Cox-Stuart test for trend.
- Two independent samples---Hollander test of extreme reactions, Fisher exact test, chi-square test of homogeneity.
- Two related samples---McNemar test.