

SURE 372: Adjustment Computations 1

**Fall
2005/06**

Instructor:	Robert Burtch
Office:	Johnson Hall 304
Office Phone:	592-2634
Office Hours:	M 9:00-9:50, M 3:00-3:50, W 9:00-9:50, F 9:00-9:50
E-Mail:	robert_c_burtch@ferris.edu

COURSE DESCRIPTION

- **This course deals with advanced computational techniques as applied to solving surveying engineering problems. The use of vectors, set theory, partial differentiation, differential equations, statistical inference and hypothesis testing and matrix algebra in the surveying engineering discipline is included. Different types of errors, viz: observational and computational and their effect on surveying calculations are examined.**

COURSE OBJECTIVES/FOCUS

- The objective of this course is to provide the basic mathematical tools necessary for advanced surveying coursework dealing with data adjustments, geodesy and advanced photogrammetry.
- At the completion of this course the student should
 - be knowledgeable of set theory and how Boolean logic is applied to surveying and mapping problems
 - understand vector analysis and perform basic vector operations
 - have a working knowledge of the creation and manipulation of matrices
 - be able to perform partial differentiation and error propagation
 - understand how to apply statistical principles to surveying and mapping measurements.

COURSE PREREQUISITES

- SURE 230
- SURE 272
- MATH 230

- Textbook
 - Advanced Surveying Calculations: Lecture Notes, by Dr. Khagendra Thapa
- Reference
 - Introductory Linear Algebra with Applications, 6th edition, by B. Kolman
 - Computer Methods for Mathematical Computations, by G. Forsythe, M. Malcom and C. Moler
 - Probability and Statistics for Engineers, 3rd edition, by I. Miller and H. Freund
 - Numerical Recipes: The Art of Scientific Computing, 2nd edition, by W. Press, S. Teukolsky, W. Vetterling, and B. Flannery

COURSE SCHEDULE:

- Lecture: M, W, R 10:00 - 10:50, SWN 211

Week 1 Aug 29 - Sep 2	Introduction to class Set Theory
Week 2 Sep 5 - 9 (No class Sep 5)	Vector analysis and vector space
Week 3 Sep 12 - 16	Vector spaces, introduction to linear algebra
Week 4 Sep 19 - 23	Linear algebra, methods of solving linear equations
Week 5 Sep 26 - 30	Mid-Term Exam, September 26 Theory of matrices

Week 6 Oct 3 - 7	Theory of matrices: LU factorization, Cholesky Factorization, Iterative methods (Jacobi and Gauss-Seidel)
Week 7 Oct 10 - 14	Partial differentiation
Week 8 Oct 17 - 21	Basic statistical concepts
Week 9 Oct 24 - 28	Mid-Term Exam, October 26 Graphical representation of data, probability
Week 10 Oct 31 - Nov 4	Estimation
Week 11 Nov 7 - 11	Hypothesis testing

Week 12 Nov 14 - 18	Statistical testing
Week 13 Nov 21 - 25 (No class Nov 24-25)	Mid-Term Exam, November 22 Differential equations
Week 14 Nov 28 - Dec 2	Differential equations, concepts of numerical analysis
Week 15 Dec 5 - 9	Norms of vectors and matrices, condition number and ill-conditioning
Week 16	Final Exam: Date and time to be announced

ASSIGNMENTS

- All work will be due on the date specified
- Late assignments will be assessed a penalty of 5% per day or fraction thereof
- All work must be completed to receive a passing grade for this course
- No assignments will be accepted after the unit exam in which the assignment was given
- Each assignment will be submitted in a report folder.

ASSIGNMENTS

- A cover sheet will be included with each assignment identifying the assignment, student name, and class
- Unless otherwise stated, only one assignment per folder will be accepted
- All work must be completed in pencil on a good quality lined paper such as engineering paper
- All formulas must be shown and identified
- When working with MathCAD or Visual Basic, define the steps involved in the solution and identify all variables and processes

ATTENDANCE POLICY

- Each student will be allowed to miss up to 4 classes, either lectures or lab, without penalty
 - These absences may be for any reason and do not require giving me an excuse
 - A student who is absent a fifth time will be required to withdraw from the course if this absence occurs during the withdrawal period of the semester
 - If this absence occurs after the withdrawal period the student will receive a failing (F) grade in the course
- All laboratory absences must be made up during the semester.

ATTENDANCE POLICY

- **Exceptions to the Attendance Policy (Verification is necessary):**
 - A University-sponsored event in which an excused absence from the Vice President for Academic Affairs office is given.
 - Death of a family member or close personal relation (friends, neighbors).
 - Extended hospitalization (this does not apply to a visit to the health center because of a cold or other illness).
 - Jury duty or being subpoenaed to testify in a court case.
 - Dangerous weather conditions in which driving is considered by local authorities to be unsafe (for commuter students).

EXCEPTIONS NOT LIKELY TO BE APPROVED:

- Day care problems
- Employment commitments
- Being in jail
- Transportation problems

CLASS CONDUCT

- Class starts on the hour so please make every effort to arrive on time by planning ahead for any contingencies.
- Class lasts for 50 minutes so do not begin to pack up your books and other items early. This is very distracting to me and your fellow students. You are expected to participate throughout the entire class period.
- Turn off all cell phones, pagers, pda's and other electronic devices before class. If there are extenuating reasons, please see me.
- During the lecture, feel free to ask questions, but refrain from conducting personal conversations. Again, this is very disruptive.
- When you leave the classroom, please pick up after yourself. Try to leave the room cleaner than when you found it.

CLASS CONDUCT

- Sleeping, eating and reading newspapers are not allowed in class. While in class the student is expected to pay attention and participate in this class and not finish work for another class during this class periods.
- Come to class prepared. Instructional material students should not be without include, as a minimum, writing material, computer disks and calculators.
- Students are expected to check the web page for this course weekly and students are responsible for all material on this web page along with textbook and other readings.

PERFORMANCE CRITERIA/ GRADING

50% from exams
50% from laboratory and
other
100% TOTAL

90 - 100% - A Range
80 - 89% - B Range
70 - 79% - C Range
60 - 69% - D Range
0 - 59% - F Range

- If you are absent on an exam day, it is your responsibility to arrange to make up the exam prior to the next class.
- Exams primarily problem-based, with some short-answer questions and definitions