

MATH 4420/5420 - Probability and Statistics II

Course description: Statistical models; Point estimation; Interval estimation; Testing statistical hypothesis; Goodness-of-fit tests.

Mathematical Prerequisites: C or better in MATH 4410.

Textbook: *An Introduction to Mathematical Statistics and Its Applications*, 6th edition, Richard Larsen and Morris Marx, Pearson.

Topic covered: This course will cover Chapter 5, Chapter 6, Chapter 9, Chapter 10, The contents of these chapters will be covered are:

Chapter 5 Estimation

Estimating Parameters: The Method of Maximum Likelihood and the Method of Moments. Interval Estimation. Properties of Estimators. Minimum-Variance Estimators: The Cramer-Rao Lower Bound. Sufficiency. Consistency.

Chapter 6 Hypothesis Testing

The Decision Rule. Testing Binomial data. Type I and Type II Errors. A Notion of Optimality: The Generalized Likelihood Ratio.

Chapter 7 The Normal Distribution

Drawing the inferences about the population mean. Drawing the inferences of population variance.

Chapter 9 Two-Sample Problems

Two-sample t Test of two means. The F test about two standard deviations. Testing of Binomial data. Confidence intervals for the Two-sample problems.

Chapter 10 Goodness-of-Fit Tests

The Multinomial Distribution. Goodness-of-Fit Tests: All Parameters known. Goodness-of-Fit: Parameters unknown. Contingency Tables.

Homework: Homework problems will be assigned through the Canvas approximately on a weekly basis and collected at the beginning of class one week thereafter. Group discussions with other students are encouraged but everyone must write his/her own

solutions. Two word-for-word identical solutions will be treated as cheating. Please write legibly, leave some space between problems, box/highlight your final answer and staple the pages together. A maximum of one homework assignment can be turned in late provided within three days after the due date. The lowest homework score will be dropped at the end of the semester.

Quizzes: There will be short in-class quizzes approximately every other week. The quizzes will be modeled around the homework problems.

Midterm Exam: A midterm exam will be given during the lecture time. The exam date will be announced in the class at least two weeks in advance.

Final Exam: The final exam will be comprehensive but will focus more on the chapters covered after the midterm.

Make-ups: Make-up exams/quizzes will be given only in very exceptional situations. The student must convince the instructor that there is a very strong reason for missing the exam. Proofs such as a doctor's excuse letter may be asked for if necessary.

Math 5420 students: will be assigned extra work to earn the graduate credit.

Grading:

Homework: 30%

Midterm: 20%

Quizzes: 20%

Final: 30%

Grading Scale:

A: 90%--100%

B: 80%--89.9%

C: 70%--79.9%

D: 60%--69.9%

F: 0%--59.9%

Teaching Methods: The instructor will integrate teaching strategies including but not limited to: lectures, large and small group discussions, cooperative learning, case studies and statistical software. Throughout this course, students will be expected to work independently and in groups to learn about statistics.

Expectations of Behaviors: The important factors of student success are attendance and participation. While few students might find it possible to succeed without regular attendance, most students will find that regular attendance is necessary for success in this course. This does not mean that regular attendance will lead success automatically. You have to learn the content of the course. All students should: (a) make regular course

attendance a priority, (b) devoting significant amount of time to studying for this course, (c) complete all the course assignments on time, and (d) participate in this course actively.

For this course to be effective, students must be active participants. You are expected to contribute to each class session in various way including but not limited to: asking/answering questions and adding relevant information. The more spontaneous you can be with your contributions, the more efficient the class is.

Treat each other with respect and dignity. There are things we all can learn from each other. This means allowing everyone to share their ideas and carefully considering their inputs. No one should ever be put down for his/her contributions.

Withdraw policy: The last day to withdraw from the course with College permission is April 17, 2020.

Disability Policy: In accordance with the University policy, if the student has a documented disability and requires accommodations to obtain equal access in this course, he or she should contact the instructor at the beginning of the semester and make this need known. Students with disabilities must verify their eligibility through the Office of Accessibility Services for students, 413 South Hall, 419-372-8495 (see <https://www.bgsu.edu/accessibility-services.html> for more information).

Student veteran-friendly campus: BGSU educators recognize student veterans' rights when entering and exiting the university system. If you are a student veteran, please communicate with your instructor so reasonable accommodations can be made for absence when drilling or being called to active duty (see <http://www.bgsu.edu/veteran/> for more information).

Codes of Conduct and Academic Honesty Policy: The instructor and students in this course will adhere to the University's general Codes of Conduct defined in the *BGSU Student Handbook*. Specifically, the Code of Academic Conduct (Academic Honesty Policy) requires that students do not cheat, fabricate, plagiarize or facilitate academic dishonesty. Students who passively engage in cheating (i.e. allowing others to cheat off of them) may receive the same consequences as the person copying.

Departmental Mediator: Dr. Kit Chan, kchan@bgsu.edu

See <http://www.bgsu.edu/departments/math/mediator>

BGSU Learning Commons: <http://www.bgsu.edu/learning-commons.html>

As one of additional resources, BGSU learning commons offers tutoring to various levels of undergraduate courses which is a free service for all BGSU students enrolled in any courses at BGSU. The Learning Commons is located on the first floor of Jerome Library. In addition to tutoring, the center also offers resources such as textbooks, computers and calculators. For this semester's hours of operation, please visit their website.

Technology Support Center (TSC): provides a central point of contact for faculty, staff and students for questions, problems reports, service requests and inquires for University computer systems and communications technologies at BGSU. Email: tsc@bgsu.edu. Phone 419-372-0999.

Religious Holidays: It is the policy of the University to make every reasonable effort to allow students to observe their religious holidays without academic penalty. In such cases, it is the obligation of the student to provide instructor with reasonable notice of the dates of religious holidays on which he/she will be absent. Absence from classes or exams for religious reasons does not relieve the student of responsibility for completing required work missed. Following the necessary notification, the students should consult with the instructor to determine what appropriate alternative opportunity will be provided, allowing the student to fully complete his/her academic responsibilities.

Course Learning Outcomes:

1. How to estimate parameters with different methods.
2. How to perform the hypothesis testing.
3. How to perform a two-sample test
4. How to perform the goodness-of-fit tests

BGP Quantitative Literacy Learning Outcomes:

1. Interpret mathematical models such as formulas, graphs and schematics, and draw inferences from them.
2. Represent mathematical information symbolically, visually, numerically and verbally.
3. Use arithmetical, algebraic and geometric methods to solve problems.
4. Estimate and check answers to mathematical problems in order to determine reasonableness, identify alternatives and select optimal results.
5. Recognize that mathematical methods are based on assumptions and have limits.