

Instructor information:

Dr. Brad Thiessen

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Hours: M 9-10; T/R 10:45 - 12:15

Email: ThiessenBradleyA@sau.edutwitter.com/Thiessen**Catalog description:**

Can you become skilled at rock/paper/scissors? How likely is it that your next cup of coffee contains a molecule of water that was once in Queen Elizabeth's tea? How likely was Joe DiMaggio's 56-game hitting streak? Are the odds of matching two random DNA profiles in the FBI's CODIS database one-in-a-billion or one-in-two? If you test positive for a disease, what's the probability that you actually have that disease? Does profiling increase the probability of catching terrorists? How does the spam filter on my email account work? Could a million monkeys typing on a million typewriters eventually write this exact course description? In this course, students will examine the meaning and mathematics of probabilities, randomness, chance, coincidence, and luck, and how they arise in everyday life. Through hands-on activities and computer-based simulations, students will develop probability models to solve real problems. Topics will include counting techniques, probability models, utility functions, the gambler's ruin, randomization methods, p-values, margins of error, and reporting/publication/sampling bias. In addition to preparing students for further statistics or research courses, this course also serves as a general introduction for all students interested in applied mathematics.

Prerequisite:

None.

By the end of this course, students will...

GenEd outcome: Use quantitative information to solve problems

- 1) Explain the concepts of probability, randomness, the gambler's ruin, utility functions, bias, error, and p-values
- 2) Apply probability to model and solve real problems
- 3) Develop a concept of magnitude and communicate probabilities accurately and clearly
- 4) Use hands-on and computer-based simulations to estimate probabilities
- 5) Use randomization methods to analyze data and draw valid conclusions
- 6) Critically evaluate analysis methods and conclusions from popular media
- 7) Appreciate the application of mathematics to a wide variety of disciplines

Course materials:Required: Rosenthal, J.S. (2006). *Struck by Lightning: The Curious World of Probabilities*. ISBN: 978-0-3090-9734-5Optional: Dworsky (2008). *Probably Not: Future Prediction Using Probability and Statistical Inference*. ISBN: 978-0-4701-8401-1Haigh, J. (1999). *Taking Chances: Winning with Probability*. ISBN: 978-0-1985-0292-0Marques de Sa, J.P. (2008). *Chance: The Life of Games & the Game of Life*. ISBN: 978-3-5407-4416-0Olofsson, P. (2010). *Probabilities: The Little Numbers That Rule Our Lives*. ISBN: 978-0-4706-2445-6Ross, K. (2007). *A Mathematician at the Ballpark: Odds and Probabilities for Baseball Fans*. ISBN: 978-0-4522-8782-2Santos, D.A. (2010). *Probability: An Introduction*. ISBN: 978-0-7637--8411-9Tintle, N. et al. (2011). *An Active Approach to Statistical Inference*.Site: <http://math.hope.edu/aasi/> Resources: <http://www.math.hope.edu/stats/>Winston, W.L. (2009). *Mathletics: How Gamblers, Managers, and Sports Enthusiasts Use Mathematics in Baseball, Basketball, and Football*. ISBN: 978-0-6911-3913-5Woolfson, M. (2008). *Everyday Probability And Statistics: Health, Elections, Gambling & War*. ISBN: 978-1-8481-6032-3Websites: CHANCE: A Magazine for People Interested in the Analysis of Data: <http://chance.amstat.org/>Significance Magazine: <http://www.significancemagazine.org/view/index.html>

Hands-on: A pack of blank index cards, at least 3 coins, at least 2 dice

Software: Web browser that will run java applets: <http://www.rossmanchance.com/applets.html>

Grading methods & criteria:

This class consists of 5 major components, each contributing 25% to your final grade:

1. Probability Basics (sets, counting, prob. rules, odds, conditional probability, expectation, classical problems)
2. Applications (games, waiting/scheduling, sports, tiny probabilities, Bayesian, gambler’s ruin, utility functions)
3. Advanced topics (margins of error, sources of bias, networks, random walks, paradoxes, chaos)
4. Randomization methods (simulation, inference, p-values, comparisons, correlation, monte carlo methods)

Your grades for each component will be calculated with the following weights:

In-class activities and participation	20%	(based on completion of in-class activities)
Problems (assigned weekly)	20%	(based on completeness and correctness)
Component mini-project	20%	(graded with a rubric we will develop as a class)
In-class exams	40%	(based on percentage of items answered correctly)

After averaging your scores in each component, your final grade will be based on the following scale:

A (100-90%)	B (90-80%)	C (80-70%)	D (70-60%)	F (60-0%)
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Extra credit policy:

Students scoring below 70% in any of the first 3 components will be allowed to complete an additional project to demonstrate attainment of course outcomes. Successfully completing the project can boost component grades to a maximum of 70%.

Attendance policy:

Many of the hands-on in-class activities cannot be fully reproduced outside of class. Because of this, it is important that you attend class and arrive on-time. While I will not deduct points for absences, we may complete graded activities in class. Missing those activities will lower your grade. It is also important to attend class because all test questions will sample content we learned, discussed, or worked with in class.

If you must miss class, I’d appreciate it if you let me know in advance. You **must** get my approval before missing any scheduled exams or due dates. Any assignment turned-in after the due date will earn a score no higher than 70%.

Accommodations policy:

Students with disabilities who believe they may need accommodations in this class are encouraged to contact the Office of Services for Students with Disabilities at 333-6275 as soon as possible to better ensure that such accommodations are implemented in a timely fashion

Academic integrity policy:

I encourage you to collaborate in studying and completing in-class activities, assigned problems, and projects. You must work alone on tests, however. Please review the SAU policy at <http://web.sau.edu/Registration/documents/AcademicIntegrityPolicy.pdf>

Policy on the use of electronic equipment:

You are free to use any appropriate resources strategically on in-class activities, assigned problems, and projects. Silence your phone, especially if you have an embarrassing ringtone.

Course procedures and expectations:

INSERT EXPLANATION HERE

Week 1 8/24 – 8/26	
Week 2 8/29– 9/2	
Week 3 9/6– 9/9 No class 9/6	
Week 4 9/12– 9/16	
Week 5 9/19 – 9/23	
Week 6 9/26 – 9/30	
Week 7 10/3 – 10/7	
Week 8 10/10 - 10/14 No class 10/14	
Week 9 10/17 - 10/21	
Week 10 10/24 – 10/28	
Week 11 10/31 - 11/4	
Week 12 11/7 - 11/11	
Week 13 11/14 – 11/18	
Thanksgiving 11/21 – 11/25	
Week 14 11/28 - 12/2	
Week 15 12/5 - 12/9	
FINAL EXAM	Math Majors: Take Major Field Test Math Education Majors: Take example certification exam