Department of Mathematics
Syllabus for Math 3120 – Elementary Probability

Recommended text: Gordon, Warren B., An Elementary Introduction to Probability, Fourth Edition, 2016.

https://www.amazon.com/Elementary-Introduction-Probability-Warren-Gordon/dp/153546514X/ref=sr_1_2?ie=UTF8&qid=1469843090&sr=8-2&keywords=warren+b+gordon

Exam dates are approximate.

TOPIC	**Reading**	**Exercises**
1.1 Introduction to Set Theory	pp. 1-11	P.11: 1, 4, 9, 17, 19, 20. 21, 24
1.2 Venn Diagrams and Counting	pp. 14-21	P.22: 1, 3, 5, 6, 7
1.3 Multiplication Principle and Counting	pp. 23-35	P.35: 2, 7, 8, 9, 11, 12, 14, 16, 17, 18, 21, 22, 24, 26,27, 28
1.4 Permutations and Combinations	pp. 39-44	P.45: 3, 5, 6, 11, 13, 16, 18, 21, 24, 25, 27, 28, 32, 36, 40
1.5 Additional Counting Examples	pp.49-53	P.53: 4, 6, 8, 9, 10, 14, 16, 17, 19, 20, 21, 22, 24
1.6 The Binomial Expansion	pp.56-58	P.59: 1, 3, 7, 11, 12, 19, 21
2.1 Basic Notions of Probability	pp.61-66	P.66: 1, 2, 3, 4, 5, 6, 7, 10, 12, 15, 19, 22
2.2 Uniform Sample Space	pp.68-71	P.71: 2, 3, 7, 8, 9, 10, 11, 12, 15, 18, 19, 21
2.3 Conditional Probability	pp. 73-79	P.79: 1, 2, 4, 5, 8, 9, 11, 13, 15, 16
2.4 Bayes' Rule	pp. 82-85	P.85: 1, 2, 4, 5, 9, 11
Exam I		
2.5 Independence	pp. 87-91	P.91: 2, 3, 6, 7, 8, 9, 12, 16, 18
2.6 Random Variables	pp. 94-102	P.102: 1, 2, 3, 4, 6, 7, 9, 11, 15, 17
2.7 Expectation and Variance - Discrete Case	pp. 104-118	P.118: 1, 3, 4, 6, 8, 9, 11, 13, 15, 17, 18, 19, 21, 24, 26, 27, 29, 30, 32
2.8 The Inequalities of Markov and Chebyshev	pp.116-121	P.121: 1, 3, 4, 6, 8, 9, 12, 13
2.9 Jointly Distributed Discrete Random Variables	pp. 124-131	P.131: 1, 3, 4, 5, 7, 9, 12
2.10 Covariance and Correlation	pp. 134-140	P.140: 2, 3, 4, 6, 10, 12, 15
2.11 The Moment Generating Function	pp. 142-145	P.145: 1, 2, 3, 4, 6, 10, 13, 14, 16, 18, 19 20
Exam II		
2.12 Important Discrete Distributions	pp. 147-163	P.164: 1, 4, 5, 7, 12, 14, 16, 17, 23, 24, 28, 29, 31, 32, 34, 35, 40, 41, 42, 44, 49, 52
Review of Integration and Improper Integrals	Appendix A.1 and A.2	Exercises assigned in class
3.1 Continuous Random Variables	pp. 170-182	P.182: 1, 2, 4, 5, 7, 9, 11, 12, 14, 17, 19, 21, 24 26
3.2 Change of Variables, Uniform and Mixed Random Variables	pp. 186 -191	P. 192: 1, 3, 6, 9, 11, 14, 19, 22, 24
3.3 The Normal Distribution	pp. 195-202	P.202: 2, 5, 6, 7, 8, 12, 13, 18, 19
3.4 The Central Limit Theorem	pp. 205-201	P.211: 1, 2, 3, 4, 5, 6, 10, 11, 13,14, 19
Exam III		
3.5 Other Important Continuous Distributions	pp. 213-219	P.220: 1, 3, 4, 8, 12, 15, 19, 20

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LEARNING GOALS OF COURSE: Upon completion of this course, students will be able to:
1. Describe the sample space of an experiment. Compute the cardinality of the sample space using methods of combinatorics such as permutations, combinations, binomial coefficients, and multinomial coefficients.
2. Enunciate Kolmogorov's probability axioms, and use these axioms to prove basic probability theorems.
3. State the law of total probability and Bayes' Theorem, and use them to calculate conditional probabilities.
4. Explain and apply the concept of a random variable (discrete and continuous). Use the distribution of a random variable to compute probabilities.
5. Construct discrete random variables and calculate the associated cumulative distribution function and probability mass function.
6. Recognize and apply common random variables (including binomial, geometric, negative binomial, Poisson, uniform, exponential, and normal random variables) to solve problems.
7. Define the moment generating function, and use it to calculate probabilities and moments.
8. Apply properties of expectation and variance to solve problems.
9. Ascertain independence or dependence of a sequence of random variables and compute the covariance of a pair of random variables.
10. Determine the distribution of a function of a random variable.
11. State Markov's inequality, Chebyshev's inequality, and the Central Limit Theorem; use these results to estimate probabilities.