



# Part 2

# Department Master Syllabus

**Camden County College**

**Blackwood, New Jersey**

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| **Course Number:**  MTH-262 | | **Course Title:**  Probabilistic Models | | | |
| **Department/Program:** Mathematics | | | | | |
| **Date of Review:** March | | 2020 | | | |
| (This Department Master Syllabus has been examined by the program/department faculty members and it is decided that no revision is necessary at this time.) | | | | | |
| **Date of Revision:** New Course, March | | | | 2020 | |
| (This Department Master Syllabus has been examined by the program/department faculty members and it is decided a change requiring a revision is necessary at this time.) | | | | | |
| N.B. A change to the course materials alone (textbooks and/or supplementary materials) may not constitute a revision. Any other change to the items listed below on this form is considered a revision and requires approval by the department/program faculty at a department/program meeting and by the division at a Chairs and Coordinator meeting. | | | | | |
| **Credits:**4 | | | | | |
| **Contact Hours** | **Lecture:** 4 | | **Lab:** 0 | | **Other:** 0 |
| Prerequisites: MTH-261 (Introduction to Mathematical Modeling) | | | | | |
| Co-requisites: None | | | | | |
| Course Description: This course introduces probability theory and data-generating processes that lead to building probability distributions from empirical data, and density functions from histograms. Topics of integration are motivated by probabilistic ideas and the transition from discrete data to continuous functions. Topics covered include single and multivariable integration techniques, random variables, sample spaces and events, sets, counting, Venn diagrams, simulation, conditional probability and independence, binomial, geometric, normal, and other distributions, sampling distributions, the Central Limit Theorem, joint probability and marginal distributions. | | | | | |
| **Student Learning Outcomes (SLOs)**  Course specific student learning outcomes  Upon completion of this course the student will be able to:   * Understand the role of randomness in data-generating processes, as assessed by homework, tests, quizzes, and projects. * Apply the properties and rules of probability, combinatorics, and probability distributions to specific problems, as assessed by homework, tests, quizzes, and projects. * Evaluate and interpret area under a curve for discrete and continuous probability distributions, as assessed by homework, tests, quizzes, and projects. * Evaluate the moment generating functions, as assessed by homework, tests, quizzes, and projects. * Compare and contrast discrete and continuous random variables in order to study the Central Limit Theorem in Mathematical Statistics, as assessed by homework, tests, quizzes, and projects. * Extend univariate concepts to their multivariate analogues, as assessed by homework, tests, quizzes, and projects.   As assessed by:  Homework, tests, quizzes, and projects | | | | | |
| **General Education Student Learning Outcomes**  If this course has applied for General Education Elective Status the general education student learning outcomes listed below must exactly match those the sponsor has identified on the General Education Request form.  General Education SLOs:  N/A  As assessed by:  N/A | | | | | |
| **Program Learning Outcomes**  List all course level student learning outcomes that interconnect to a particular program learning outcome.   1. All CSLOs are connected to DSC.AAS PSLO 2 (Develop solid analytical reasoning, critical thinking and technical skills in order to extract, mangle, analyze and present data for multiple disciplines to broad audiences that follow professional standards to enhance understanding and decision-making).   Describe the assessment of the interconnected program learning outcome(s).  Various course level assessment instruments will be used to target specific program learning outcomes. | | | | | |
| **Course Outline:**  Unit I. Integration   1. Review of Integration Techniques   i. Basic and U-Substitution  ii. Area Between Two Curves  iii. Integration by Parts  iv. Partial Fraction Decomposition  B. Double and Triple Integrals  Unit II. Probability Theory  A. Set Theory  B. Basic of Probability Theory  C. Conditional Probability and Independence  D. Random Variables  E. Distribution Functions  F. Density and Mass Functions    Unit III. Transformations and Expectations  A. Distribution of Functions of a Random Variable  B. Expected Values  C. Moments and Moment Generating Functions  D. Differentiating Under an Integral Sign  Unit IV. Common Families of Distributions  A. Introduction  B. Discrete Distributions  C. Continuous Distributions  D. Exponential Families  E. Location and Scale Families    Unit V. Multiple Random Variables  A. Joint and Marginal Distributions  B. Conditional Distributions and Independence  C. Bivariate Transformations  D. Hierarchical Models and Mixture Distributions  E. Covariance and Correlation  F. Multivariate Distributions  Unit VI. Properties of a Random Sample  A. Basic Concepts of Random Samples  B. Sums of Random Variables from a Random Sample  C. Sampling from the Normal Distribution  D. Convergence Concepts  E. Generating a Random Sample | | | | | |
| **Course Activities:**    The classroom activities will include formal and informal lectures where new material and assigned problems will be explained. Students will be encouraged to participate in discussion during the presentation and at times present problems on the whiteboard. Time will be set aside to answer specific questions concerning homework problems and other previous material. Software and/or calculators (TI 83, 84, 89) exercises will be given and methods of analysis will be discussed. | | | | | |
| **Course Materials:**  Textbook(s): TBD  Supplemental Materials: TBD  Software Licenses: Free software tools  Computers: Yes | | | | | |
| **Course Assessment Plan**  How often and by what means will the effectiveness of this course as part of the curriculum be assessed?    Assessment cycle to be determined by the members of the Mathematics department. Students will be evaluated on the degree to which student learning outcomes are achieved. Assessment instruments may be in the form of tests and/or projects. | | | | | |