The Applied and Computational Mathematics (ACM) Program at the Johns Hopkins University will offer graduate courses in statistics and applied mathematics in the spring semester (22 January 2007 to 5 May 2007) at locations in the Baltimore–Washington area (Howard and Montgomery Counties, Maryland).

Subject to meeting admission criteria, a non-degree candidate may register as a special student to take one or more courses to enhance mathematical and statistical skills. Courses being offered in spring 2007 are given below. These courses are scheduled at times convenient for the working adult. Registration and general information is at http://www.epp.jhu.edu. Information specific to the ACM Program is at http://www.epp.jhu.edu/academic-programs/applied-and-computational-mathematics; some of the courses below have additional information available at the Course Homepages site http://www.epp.jhu.edu/course-homepages/#625. An Open House for prospective students will be held on Thursday, 30 November 2006, at the JHU Applied Physics Laboratory (see http://www.epp.jhu.edu/open-houses). For further information related to academic requirements and course content, please contact Dr. James Spall, Program Chair (240-228-4960).

625.401 Real Analysis
Instructor: Stacy D. Hill
Time and location: Thursdays, 7:15 – 10:00PM, Applied Physics Laboratory (southern Howard County)
This course presents a rigorous treatment of fundamental concepts in analysis. Emphasis is placed on careful reasoning and proofs. Topics covered include the completeness and order properties of real numbers; limits and continuity; conditions for integrability and differentiability; infinite sequences and series. Basic notions of topology and measure are also introduced.
Prerequisite: Multivariate calculus

625.403 Statistical Methods and Data Analysis
Instructor: Sue-Jane Wang
Time and location: Tuesdays, 4:30 – 7:10PM, Montgomery County Center (Rockville, MD)
This course introduces commonly used statistical techniques. The intent of this course is to provide an understanding of statistical techniques and a tool box of methodologies. Statistical software is used so students can apply statistical methodology to practical problems in the workplace. Intuitive developments and practical use of the techniques are emphasized rather than theorem/proof developments. Topics include the basic laws of probability and descriptive statistics, conditional probability, random variables, expectation, discrete and continuous probability models, joint and sampling distributions, hypothesis testing, point estimation, confidence intervals, contingency tables, logistic regression, and linear and multiple regression.
Prerequisite: Multivariate calculus.

625.404 Ordinary Differential Equations
Instructor: Ronald Farris
Time and location: Wednesdays, 7:15 – 10:00PM, Applied Physics Laboratory (southern Howard County)

Topics discussed throughout the course include methods of solving first-order differential equations, existence and uniqueness theorems, second-order linear equations, power series solutions, higher-order linear equations, systems of equations, non-linear equations, Sturm-Liouville theory, and applications.
Prerequisite: Two or more terms of calculus.

625.417 Applied Combinatorics and Discrete Mathematics
Instructor: J. Miller Whisnant
Time and location: Tuesdays, 4:30 – 7:10PM, Applied Physics Laboratory (southern Howard County)
Combinatorics and discrete mathematics are increasingly important fields of mathematics because of their extensive applications in computer science, statistics, operations research, and engineering. The purpose of this course is to teach students to model, analyze, and solve combinatorial and discrete mathematical problems. Topics include elements of graph theory, graph coloring and covering circuits, the pigeonhole principle, counting methods, generating functions, recurrence relations and their solution, and the inclusion-exclusion formula. Emphasis is on the application of the methods to problem solving.
Prerequisite: Two or more terms of calculus.

625.438 Neural Networks
Instructor: J. Miller Whisnant
Time and location: Mondays, 4:30 – 7:10PM, Applied Physics Laboratory (southern Howard County)
This course provides an introduction to concepts in neural networks and connectionist models. Topics include parallel distributed processing, learning algorithms, and applications. Specific networks discussed include Hopfield networks, bidirectional associative memories, perceptrons, feedforward networks with back propagation, and competitive learning networks, including self-organizing and Grossberg networks. Software for some networks is provided.
Prerequisite: Multivariate calculus.

625.462 Design and Analysis of Experiments
Instructor: Jacqueline K. Telford
Time and location: Tuesdays, 7:15 – 10:00PM, Applied Physics Laboratory (southern Howard County)
Statistically designed experiments are the efficient allocation of resources to maximize the amount of information obtained with a minimum expenditure of time and effort. Design of experiments is applicable to both physical experimentation and computer simulation models. This course covers the principles of experimental design, the analysis of variance method, the difference between fixed and random effects and between nested and crossed effects, and the concept of confounded effects. The designs covered include completely random, randomized block, Latin squares, split-plot, factorial, fractional factorial, nested treatments and variance component analysis, response surface, optimal, Latin hypercube, and Taguchi. Any experiment can correctly be analyzed by learning how to construct the applicable design structure diagram (Hasse diagrams).
Prerequisites: Multivariate calculus, linear algebra, and one semester of graduate probability and statistics (e.g. 625.403 Statistical Methods and Data Analysis). Some computer-based homework assignments will be given.

625.726 Theory of Statistics II
Instructor: Mostafa Aminzadeh
Time and location: Mondays, 4:30 – 7:10PM, Applied Physics Laboratory (southern Howard County)
This course is the continuation of 625.725. It covers method of moments estimation, maximum likelihood estimation, the Cramér-Rao inequality, sufficiency and completeness of statistics, uniformly minimum variance unbiased estimators, the Neyman-Pearson Lemma, the likelihood ratio test, goodness-of-fit tests, confidence intervals, selected non-parametric methods, and decision theory.
Prerequisite: 625.725 Theory of Statistics I or equivalent

625.734 Queuing Theory with Applications to Computer Science
Instructor: Eric Blair
Time and location: Wednesdays, 4:30 – 7:10PM, Applied Physics Laboratory (southern Howard County)
Queues are a ubiquitous part of everyday life; common examples are supermarket checkout stations, help desks call centers, manufacturing assembly lines, wireless communication networks, and multi-tasking computers. Queuing theory provides a rich and useful set of mathematical models for the analysis and design of service process for which there is contention for shared resources. This course explores both theory and application of fundamental and advanced models in this field. Fundamental models include single and multiple server Markov queues, bulk arrival and bulk service processes, and priority queues. Applications emphasize communication networks and computer operations, but may include examples from transportation, manufacturing, and the service industry. Advanced topics may vary.
Prerequisites: Multivariate calculus and knowledge of probability.

625.743 Stochastic Optimization and Control
Instructor: James C. Spall
Time and location: Thursdays, 4:30 – 7:10PM, Applied Physics Laboratory (southern Howard County)
Stochastic optimization plays an increasing role in the analysis and control of modern systems. This course introduces the fundamental issues in stochastic learning and optimization with special emphasis on cases where classical deterministic search techniques (steepest descent, Newton-Raphson, linear and nonlinear programming, etc.) do not readily apply. These cases include many important practical problems, which will be discussed throughout the course (e.g. neural network training, nonlinear control, experimental design, simulation-based optimization, sensor configuration, image processing, discrete-event systems, etc.). Both global and local optimization problems will be considered. Techniques such as random search, stochastic approximation, simulated annealing, evolutionary computation (including genetic algorithms), and machine learning are discussed.
Prerequisites: Multivariate calculus, linear algebra, and at least one semester of graduate probability and statistics (e.g. 625.403 Statistical Methods and Data Analysis). Some computer-based homework assignments will be given. It is recommended that this course be taken in the last half of a student's degree program for those seeking an M.S. degree.

625.251 Applied Mathematics II (this course is not offered for graduate credit)
Instructor: James D'Archangelo
Time and location: Wednesdays, 7:15 – 10:00PM, Applied Physics Laboratory (southern Howard County)
(This course is a companion to 625.250, but 625.250 is not a prerequisite) Topics include ordinary differential equations, Fourier series and integrals, the Laplace transformation, Bessel functions and Legendre polynomials, and an introduction to partial differential equations.
Prerequisites: Differential and integral calculus. Students with no experience in linear algebra may find it helpful to take 625.250 Applied Mathematics I first.