



# Part 2

# Department Master Syllabus

**Camden County College**

**Blackwood, New Jersey**

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| **Course Number:**  DSC-230 | | **Course Title:**  Statistical and Machine Learning | | | |
| **Department/Program:** Math/Data Science | | | | | |
| **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:**3 | | | | | |
| **Contact Hours** | **Lecture:** 2 | | **Lab:** 2 | | **Other:** 0 |
| Prerequisites: CSC-272, DSC-203 | | | | | |
| Co-requisites: None | | | | | |
| Course Description: This course blends the algorithmic perspective of machine learning in computer science and the predictive perspective of statistical thinking. The focus is on common machine learning methods and their application to problems in various disciplines. An understanding of the theoretical foundations of statistical learning is coupled with the practical skills necessary for successful application to new problems in science and industry. | | | | | |
| **Student Learning Outcomes (SLOs)**  Course specific student learning outcomes  Upon completion of this course the student will be able to:   * Apply learned gathering, cleaning, analysis and presentation techniques to big data sets using R as assessed by labs and projects * Practice dividing data sets into training, validation, and testing sets as assessed by labs and projects * Utilize and evaluate different tools and models in data analytics as assessed by labs and projects * Understand the difference between supervised and unsupervised machine learning as assessed by labs and projects * Apply supervised and unsupervised machine learning techniques as appropriate to labeled and unlabeled data as assessed by labs and projects   As assessed by:  Students will be evaluated on the degree to which student learning outcomes are achieved. Methods include programming projects and lab work. | | | | | |
| **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.  All CSLOs target the following DSC.AAS PSLOs  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.  Demonstrate the ability to work independently and as a member of a team with modern technical tools to accomplish data life cycle project goals and meet deadlines.    Communicate technical knowledge effectively for a broad range of persons that include customers, managers, and peers  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:**   1. R and RStudio Overview and Installation 2. Importing and Tidying Data 3. Data Transformation 4. Data Visualization 5. Supervised Machine Learning and Modeling:    1. Linear regression:       1. Simple linear regression       2. Multiple linear regression       3. Labs   B. Classification:  1. Logistic regression  2. Linear discriminant analysis  3. Labs  C. Resampling methods:  1. Cross-Validation  2. The Bootstrap  D. Nonlinear:  1. Polynomial regression  2. Step functions  3. Basic functions  4. Regression splines  E. Tree-based methods:  1. The basics of decision trees  2. Bagging, random forests, boosting  3. Labs  VI. Unsupervised learning:  1. K-means clustering and its variance  2. Hierarchical clustering  3. Labs | | | | | |
| **Course Activities:**  The classroom activities will include formal and informal lectures, structured, supervised labs using software tools to practice the course content with modern visualization tools. There will also be discussion sessions for case studies analysis and student presentations review, critique, and feedback. During lectures, new material, assigned readings and sample case studies will be explored. Students are expected to contribute to the discussion and present their work for review. | | | | | |
| **Course Materials:**  Textbook(s): TBD  Supplemental Materials: TBD  Software Licenses: N/A  Computers: Students will need access to a computer for assigned projects and homework | | | | | |
| **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 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 programming projects. | | | | | |