

# Department Master Syllabus

**Camden County College**

**Blackwood, New Jersey**

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| **Course Number:**  CSC-272 | | **Course Title:**  Data Science Applications Programming | | | |
| **Department/Program:** Computer Science | | | | | |
| **Date of Review:** September | | 2023 | | | |
| (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:** October | | | | 2023 | |
| (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-171 or CSC-121 and MTH-111 or MTH-171 | | | | | |
| Co-requisites: NONE | | | | | |
| Course Description: This intermediate-level programming course assumes the student has a foundation in statistical methods and has successfully completed a college-level procedural programming course as prerequisite. This course is presented using the Python 3 language with a focus on developing foundational object-oriented programming skills and event-driven applications development for computing and data science majors. Topics include, secure coding techniques, testing and debugging code that uses dictionaries, tuples, strings, lists and files and performing natural language processing (NLP) tasks. Applications in big data, data mining, will be examined and practiced. Machine learning and deep learning will be explored as time permits. Students will practice the skills and concepts covered in lecture during structured, supervised laboratory time. | | | | | |
| **Student Learning Outcomes (SLOs)**  Course specific student learning outcomes  Upon completion of this course the student will be able to:  • Select and implement appropriate data structures and OOP techniques to solve given problems. Assessed through practice programs, written analysis and assessments.  • Using OOP and secure coding techniques, create reusable software components from ADT specifications to solve a range of programming problems. Assessed through practice programs.  • Create software solutions that incorporate the use of applicable Python API libraries. Assessed through practice programs and written analysis.  • Analyze programming code, trace execution and perform validity testing and debugging. Assessed through practice programs, written analysis and assessments.  • Incorporate learned NLP tasks to clean and prepare big data for analysis. Assessed through 2 practice programs and assessments.  • Understand and manipulate a variety of big data sets including structured (SQL) and noSQL data. Assessed by practice programs and written analysis.  • Explain supervised v unsupervised ML algorithms and implement k-nearest neighbor algorithm. Assessed by programming project, written assessments.  As assessed by:  Students will be evaluated on the degree to which student learning outcomes are achieved. A variety of methods may be used such as tests, class participation, programming projects, homework assignments, online learning tools, etc. | | | | | |
| **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.  Analyze, design, develop and test computer-based applications using problem solving and analytical skills developed throughout the program.  Apply scientific and mathematical principles to study computer science  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:**  I. Review of Python 3 Lists, Tuples, Dictionaries and Sets  A. Lists and Dictionaries comprehension  B. List, Dictionary and Set Operations  C. Implementing dynamic visualization programs  II. Arrays, Series and Data Frames  A. Using Arrays and performing efficient retrieval from arrays  B. compare and contrast arrays v. list data structures  C. Understanding shallow v. deep copy  D. programming with multidimensional arrays  E. Introduction to using Pandas Series and Data Frames 3  III. A deeper dive into Strings, Files and Exceptions  A. Review String operations (slicing, indexing, substrings and the like)  B. Introduction to Regular Expressions  C. Review File i/o using text and binary files with pickle serialization  D. Manipulating spreadsheet and csv file data  E. Applying data analysis to input retrieved from files  IV. Building and Using Reusable components via Object-Oriented Programming  A. Controlling access to member using secure coding techniques  B. implementing inheritance and polymorphism  C. Understanding namespaces and scopes  D. operating overloading  E. Tracing, documenting, testing and debugging object-oriented programs  V. Natural Language Processing (NLP) Applications  A. Understand and describe common NLP tasks and challenges  B. Perform NLP tasks using existing library tools  C. Using graphics packages to present data visualizations  VI. Machine Learning   1. Supervised v Unsupervised algorithms 2. Training v testing data 3. Applying k-Nearest Neighbor algorithm for classification 4. Simple linear regression   VII. Big Data Applications  A. Manipulating SQL and NoSQL data  B. Understanding Hadoop and Spark  C. Proliferation of the IoT (Internet of Things) and their impact | | | | | |
| **Course Activities:**    The classroom activities will include formal and informal lectures and structured, supervised active learning laboratory sessions. During lectures, new material and assigned problems will be explained. Students are encouraged to contribute to the discussion and to ask questions about the material. Active learning sessions will include guided problem solving and best programming practices techniques to topical data analytics problems. | | | | | |
| **Course Materials:**  Textbook(s): TBD  Supplemental Materials: TBD  Software Licenses: Free software tools  Computers: Will be needed by online students and used for instruction, student learning activities and homework in face-to-face courses. | | | | | |
| **Course Assessment Plan**  How often and by what means will the effectiveness of this course as part of the curriculum be assessed?    This course will be assessed on a set schedule determined by the CS department. | | | | | |