

Program Objective (condensed form)	CO01	CO02	CO03	CO04	CO05	CO06	CO07	CO08	CO09	CO10
PO-B: analyze a problem and define its computing requirements						✓		✓	✓	✓
PO-C: design, implement and evaluate applications										
PO-D: function effectively in teams to accomplish a common goal										
PO-E: professional, ethical, and social responsibilities										
PO-F: communicate effectively with a range of audiences										
PO-G: local and global impact of computing on people and society										
PO-H: need for continuing professional development										
PO-I: use current techniques, skills, and tools						✓				✓
PO-J: apply theory and principles to model and design systems						✓				✓
PO-K: apply design and development principles in constructing software										
PO-L: apply knowledge of computing and mathematics appropriate to the discipline	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
note - full statements of the Program Outcomes (program objectives) for the Computer Science Major can be found in the document <i>Computer Science Major Program Educational Objectives and Program Outcomes</i> on the Assessment page of the Computer Science Major (cs.salemstate.edu)										

Topics:

- sets **AL4(1, 0), DS1(2, 0)**
 - definitions, notations, subsets
 - Venn diagrams, union, intersection, complement
 - power sets, Cartesian product, cardinality
 - Russell's paradox, halting problem
- relations **DS1(2, 0)**
 - Relations on sets, the inverse of a relation
 - reflexivity, symmetry, transitivity
 - equivalence relations
- functions **DS1(2, 0)**
 - functions on sets,
 - one-to-one, onto, inverse
 - composition, bijections
- logic **DS2(9, 0)**
 - introduction
 - statements, compound statements, conditional/unconditional statements
 - truth table, logical connectives
 - valid/invalid arguments
 - propositional logic
 - conjunctive and disjunctive
 - well-formed formula
 - inference rules (modus ponens and modus tollens)
 - predicate logic
 - predicates
 - universal and existential quantification
- proof theory and techniques **DS3(10, 0)**
 - elementary number theory and methods of proof
 - definition, conjecture, proof, and disproof, the structure of mathematical proofs
 - notations of implication, equivalence, converse, inverse, contrapositive, negation, and contradiction
 - proof by contradiction, disproving by counterexample
 - sequence, mathematical induction
 - summation and product notations

- mathematical induction
 - recursion
 - definition of recurrence relation, examples (including Fibonacci numbers)
 - structural induction
- counting and probability **DS4(5, 0), DS6(3, 0)**
 - counting arguments
 - set cardinality and counting
 - sum and product rule
 - inclusion-exclusion principle (counting elements of disjoint sets)
 - arithmetic and geometric progression
 - the pigeonhole principle
 - permutations, combinations
 - solving recurrence relations (with examples including Fibonacci numbers)
 - probability
 - events, sample space, finite probability space
 - counting elements of lists and sublists, probability measures
 - probability tree and multiplication rule
 - independence and conditional probability
- graphs and trees **AL3(1, 1), DS5(4, 1)**
 - graphs: definition and basic properties
 - graphs: trails, paths, and circuits
 - undirected, directed, and weighted graphs
 - matrix representation of graphs, matrix multiplication
 - trees
 - definition and properties
 - traversal strategies
 - spanning trees, minimum spanning trees, Kruskal's and Prim's algorithms
- basic analysis of algorithms **AL1(1, 1)**
 - definition, properties, and use of big-O notation

Assignments/Quizzes:

Homework will be assigned for each section/topic covered in the class. The problems pertaining to a section/topic completed during a given class will be due at the start of the next Class when usually the solutions will be given in the class. Students can work on the problems freely with others from class, unless it is for an assignment to be turned in and you are instructed to work alone. For the most part, *homework will be evaluated through quizzes*. The quiz questions will be mostly like the assignment questions and thus the quiz grades will give a very accurate evaluation of students' understanding of the course topics and performance on both the quizzes and assignments.

Tests (Quizzes and Examinations):

There will be one midterm and one *comprehensive* final examination and several (6-10) quizzes. The midterm will be held in week 8 depending on class progress. Quizzes will be held in class hours (some of the quizzes may be administered as take-home "quizzes").

Grading:

Final grades will be determined using the following approximate weights: homework, 10%; quizzes, 45%, midterm, 15%; final examination, 30%.

Course Objective / Assessment Mechanism matrix

	Homework Assignments	Quizzes	Midterm Exam	Final Examination
CO01	✓	✓	✓	✓
CO02	✓	✓	✓	✓
CO03	✓	✓	✓	✓
CO04	✓	✓	✓	✓
CO05	✓	✓	✓	✓
CO06	✓	✓	✓	✓

	Homework Assignments	Quizzes	Midterm Exam	Final Examination
CO07	✓	✓	✓	✓
CO08	✓	✓	✓	✓
CO09	✓	✓	✓	✓
CO10	✓	✓	✓	✓

Bibliography:

- Epp, Susanna S. Epp. **Discrete Mathematics with Applications. Fourth Edition.** Cengage Learning, 2011.
- Hunter, David J. **Essentials of Discrete Mathematics (The Jones & Bartlett Learning International Series in Mathematics).** Second Edition. Jones & Bartlett Learning, 2010.
- Johnsonbaugh, Richard. **Discrete Mathematics. Seventh Edition.** Pearson, 2007.
- Lipschutz, Seymour and Lipson, Marc. **Schaum's Outline of Discrete Mathematics, Revised Third Edition (Schaum's Outline Series).** McGraw-Hill, 2009.
- Rosen, Kenneth. **Discrete Mathematics and Its Applications. Seventh Edition.** McGraw-Hill Science/Engineering/Math, 2011.
- Wallis, W.D. **A Beginner's Guide to Discrete Mathematics. Second Edition.** Birkhauser, 2012.

Academic Integrity Statement:

"Salem State University assumes that all students come to the University with serious educational intent and expects them to be mature, responsible individuals who will exhibit high standards of honesty and personal conduct in their academic life. All forms of academic dishonesty are considered to be serious offences against the University community. The University will apply sanctions when student conduct interferes with the University primary responsibility of ensuring its educational objectives." Consult the University catalog for further details on Academic Integrity Regulations and, in particular, the University definition of academic dishonesty.

The Academic Integrity Policy and Regulations can be found in the University Catalog and on the University website (http://catalog.salemstate.edu/content.php?catoid=13&navoid=1295#Academic_Integrity). The formal regulations are extensive and detailed - familiarize yourself with them if you have not previously done so. A concise summary of and direct quote from the regulations: "Materials (written or otherwise) submitted to fulfill academic requirements must represent a student's own efforts". *Submission of other's work as one's own without proper attribution is in direct violation of the University's Policy and will be dealt with according to the University's formal Procedures. Copying without attribution is considered cheating in an academic environment - simply put, **do not do it!***

University-Declared Critical Emergency Statement:

In the event of a university-declared emergency, Salem State University reserves the right to alter this course plan. Students should refer to www.salemstate.edu for further information and updates. The course attendance policy stays in effect until there is a university-declared critical emergency.

In the event of an emergency, please refer to the alternative educational plans for this course, which will be distributed via standing class communication protocols. Students should review the plans and act accordingly. Any required material that may be necessary will have been previously distributed to students electronically or will be made available as needed via email and/or Internet access.

Equal Access Statement:

"Salem State University is committed to providing equal access to the educational experience for all students in compliance with Section 504 of The Rehabilitation Act and The Americans with Disabilities Act and to providing all reasonable academic accommodations, aids and adjustments. **Any student who has a documented disability requiring an accommodation, aid or adjustment should speak with the instructor immediately.** Students with Disabilities who have not previously done so should provide documentation to and schedule an appointment with the Office for Students with Disabilities and obtain appropriate services."

Note: This syllabus represents the intended structure of the course for the semester. If changes are necessary, students will be notified in writing and via email.