



Program Objective (condensed form)	CO01	CO02	CO03	CO04	CO05	CO06	CO07	CO08
<b>PO-I:</b> use current techniques, skills, and tools								
<b>PO-J:</b> apply theory and principles to model and design systems	✓	✓	✓	✓	✓	✓	✓	✓
<b>PO-K:</b> apply design and development principles in constructing software								
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:**

- review of background material:
  - sets, relations, functions, sequences DS1(1),DS2(1)
  - alphabets, strings, languages AL5(3)
  - proof methods (mathematical induction, proof by contradiction, the technique of diagonalization) DS3(2)
  - digraphs, tree diagrams DS5(2)
- formal languages and grammars AL5(7)
  - regular expressions and regular languages
  - deterministic context-free languages
  - context-free languages
  - context-sensitive languages
  - recursively enumerable languages
  - LL(k) and LR(k) grammars and languages
- finite automata: AL7(7) (not core)
  - deterministic (DFA)
  - nondeterministic (NDFAs)
  - nondeterministic with empty moves (NDFAs)
  - the Pumping Lemma for regular languages
- pushdown automata AL7(9) (not core)
- Turing machines
- random access machines
- computability; the Church-Turing thesis
- the Halting Problem
- decidability
- parallel random access machines
- computational complexity: AL6(7) (not core)
  - simulations and reducibilities
  - circuits and circuit complexity
  - the complexity class NC
  - the complexity classes P and NP
  - P-completeness and NP-completeness

**Assignments and Examination:**

Periodic written homework assignments will be given, including reports on assigned reading in books and journals. Oral presentations on selected topics may also be required. There are several quizzes and one comprehensive final examination.

The final grade will be determined using the following approximate weights:

written assignments	40%
final examination	30%
quizzes and oral presentations	30%.

**Course Objective / Assessment Mechanism matrix**

	Written Assignments	Quizzes	Oral Presentations	Final Examination
CO01	✓		✓	✓

CO02	✓	✓	✓	
CO03	✓	✓		✓
CO04	✓	✓	✓	✓
CO05	✓		✓	✓
CO06	✓	✓	✓	✓
CO07	✓		✓	✓
CO08	✓	✓	✓	✓

### Bibliography:

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- Boolos, George S.; Burgess, John P.; Jeffrey, Richard C. **Computability and Logic. Fifth Edition**. Cambridge University Press, 2007.
- Cohen, Daniel I. A. **Introduction to Computer Theory, Second Edition**. Wiley, 1996.
- Friedl, Jeffrey E. F. **Mastering Regular Expressions. Third Edition**. O'Reilly Media, 2006.
- Goyvaerts, Jan; Levithan, Steven. **Regular Expressions Cookbook**. O'Reilly Media, 2009.
- Greenlaw, Raymond; Hoover, James H. **Fundamentals of the Theory of Computation: Principles and Practice**. Morgan Kaufman, 1998.
- Hopcroft, John E.; Motwani, Rajeev; Ullman, Jeffrey D. **Introduction to Automata Theory, Languages, and Computation. Third Edition**. Addison Wesley, 2006.
- Kozen, Dexter. **Automata and Computability**. Springer, 1997.
- Kozen, Dexter. **Theory of Computation**. Springer, 2010.
- Lewis, Harry R.; Papadimitriou, Christos H. **Elements of the Theory of Computation. Second Edition**. Prentice Hall, 1997.
- Linz, Peter. **An Introduction to Formal Languages and Automata. Fourth Edition**. Jones and Bartlett, 2006.
- Martin, John C. **Introduction to Languages and the Theory of Computation. Fourth Edition**. McGraw-Hill, 2010.
- Moret, Bernard M. **The Theory of Computation**. Addison-Wesley, 1997.
- Parkes, Alan, P. **A Concise Introduction to Languages and Machines**. Springer, 2008.
- Sipser, Michael. **Introduction to the Theory of Computation. Second Edition**. Course Technology, 2005.
- Sudkamp, Thomas A. **Languages and Machines: An Introduction to the Theory of Computer Science. Third Edition**. Addison-Wesley, 2005.

### 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](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](http://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.