J. Sargeant Reynolds Community College
Course Content Summary

Course Prefix and Number: CSC 295 **Credits:** 3

Course Title: Topics in Computer Science: Introduction to the Theory of Computations

Course Description: Focuses on complexity classes, grammars, formal languages, Turing machines, and computability. Prerequisite: CSC 208, or equivalent, with a grade of C or better. Lecture 3 hours per week.

General Course Purpose: This course is equivalent to CMSC 303 – Introduction to the Theory of Computations at VCU, and is designed for students transferring to VCU in the Computer Science major.

Course Prerequisites and Co-requisites:
Prerequisite: CSC 208, or equivalent, with a grade of C or better

Course Objectives:
Upon completing the course, the student will be able to

a. Apply knowledge of computing and mathematics appropriate to the course topics and to the discipline;
b. Analyze a problem, and identify and define the theoretical computing requirements appropriate to its solution;
c. Demonstrate an understanding of the Chomsky Hierarchy of language classes and match each class of language to the model of computation associated with it;
d. Create deterministic and non-deterministic finite state machines to accept regular languages;
e. Examine regular expressions and regular grammars and show their equivalence, along with finite state machines, to describe the class of regular languages;
f. Compare regular and non-regular grammars and apply the pumping lemma to show that a language is not regular;
g. Analyze algorithms and decision procedures for context-free languages and apply the pumping lemma to prove that a language is not context-free;
h. Examine pushdown automata and show that they are equivalent to context-free grammars;
i. Describe the functionality of basic Turing machines and the universal Turing machine and explain how they can be used to recognize a language and compute a function;
j. Describe the Church-Turing thesis;
k. Explain halting problem and why it is undecidable;
l. Examine Decidable, Semi-decidable, and Undecidable languages; and
m. Analyze the time and space requirements of problems to determine appropriate and complexity classes (P, NP, NP-complete, PSPACE, NPSPACE, and Savitch's Theorem).

Major Topics to Be Included:

a. Finite State Machines and Regular Languages
b. Context-Free Languages and Pushdown Automata
c. Turing Machines and Undecidability
d. Analysis of Complexity

Effective Date of Course Content Summary: August 16, 2016