RHINEBECK CENTRAL SCHOOL DISTRICT
PRIORITIZED CURRICULUM
AP COMPUTER SCIENCE, JAVA SYLLABUS

COURSE OVERVIEW:

AP Computer Science, JAVA, is a college prep course for potential computer science majors and a foundation course for students planning to enter other technical fields of study. Object oriented programming methodology and functional algorithm development are stressed. The class is set in the computer lab so coding, both examples and student created, is the greater part of instruction and evaluation.

** The course teaches students to design and implement computer based solutions to problems in a variety of application areas. These applications include, but are not limited to the following: Mathematics (Factorial, summation, perfect numbers) Business (Bank Accounts, Interest and Investments) Problem solving through games (Guess the number, NIM, Card games) and Modeling (Soda machine program, School roster program). Along with a thorough investigation of the current case study, less involved reviews of the Marine Biology case study, the Calculator case study, and the File Manager case study further the study of computer based solutions in multiple application areas.*

The AP class is usually preceded by, but it is not mandated, an introduction to programming class.

*** Please note that any lines with asterisks to the left denote changes to the originally submitted Audit and are highlighted in italics*

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TEXTS:

Hortsman, Cay. Computing Concepts with Java Essentials, 3rd ed. New York: Wiley, 2003.

Litvin, Maria. Be Prepared for the AP Computer Science Exam in Java. Andover, Massachusetts: Skylight Publishing, 2003.

Horwitz, Susan. Review for the AP Computer Science Exam in Java. Boston, Mass: Adison Wesley, 2003.

Schram, Leon. Exposure Java, 2006.

http://csis.pace.edu/~bergin/KarelJava2ed

College Board. "AP GridWorld Case Study." New York: College Entrance Examination Board, 2006.

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UNIT 1: JAVA BASICS

Topics	Objectives	Resources	Assessments	Timeline
Computer Basics ***Hardware* - CPU, Memory (Primary/ Secondary), Peripherals ▪ Software: - System and Application ▪ Programming Languages: Low-level (Binary) to High-level ▪ Principles of responsible computer use: Copyright, intellectual property ethics, social responsibilities, ***Privacy, Legal issues* ▪ IDE basics: JCreator ▪ Compiling basic code ▪ System class introduction: Output (println)	▪	▪ Java Essentials : chapter 1 ▪ Exposure Java ▪ JCreator	▪ Worksheets ▪ Quizzes ▪ Programs : small "Driver" programs, text output with escape sequences re-introduced in decisions and loops ▪ Unit test	Weeks 1-5

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UNIT 2: KAREL J. ROBOT

Topics	Objectives	Resources	Assessments	Timeline
▪ Identifiers/variables ▪ Classes ▪ Instance fields ▪ Methods **Algorithm development* ▪ Objects	▪	▪ Karel J. Robot ▪ Java Essentials: chapter 2 ▪ Exposure Java	▪ Quizzes ▪ Programs - Robot Class - Constructor - Modifiers: movement - Accessors: location and output	Weeks 6 - 7

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UNIT 3: Variable, Constants, Arithmetic Operators, Math Class, and the Assignment Operators

Topics	Objectives	Resources	Assessments	Timeline
▪ Identifiers ▪ Syntax ▪ Declaring primitive data type variables ▪ Final variables ▪ Memory allocation ▪ Assignments ▪ Class methods: sqrt, pow, abs ▪ Binary operators ▪ Integer operators: % and / **Alternate algorithm development and investigation*	▪	▪ Java Essentials: chapter 3 ▪ Exposure Java	▪ Quizzes ▪ Programs ▪ Unit test	Week 8

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UNIT 4: OOP

Topics	Objectives	Resources	Assessments	Timeline
▪ Declaring classes ▪ Headings ▪ Access specifiers ▪ Parameters ▪ Instance fields ▪ Methods: - constructors - modifiers - accessors - return statement ▪ Driver ▪ Main method ▪ Calling statements ** Algorithm Design: Bottom Up and Top-Down Design*	▪	▪ Java Essentials: Chapter 2 and 4 ▪ Exposure Java	▪ Quizzes ▪ Programs ▪ Classes and drivers ▪ Unit test	Weeks 9-10

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UNIT 5: String Class and Input

Topics	Objectives	Resources	Assessments	Timeline
▪ Static methods ▪ Immutable ▪ String methods: - length - chartAt - substring ▪ Concatenation ▪ Parsing - integer and double class * *Alternative algorithm solutions*	▪	▪ Java Essentials: Chapter 3 ▪ Exposure Java	▪ Quizzes ▪ Programs: - classes and drivers - static methods - text graphics ▪ Unit test	Week 11

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UNIT 6: Decisions

Topics	Objectives	Resources	Assessments	Timeline
▪ Boolean: expressions, variables, operators ▪ Compound: And, Or, Not ▪ Demorgan's ▪ Short circuit evaluation ▪ Conditions ▪ Control statements ▪ Single and double alternatives: - if - if/else ▪ Extended ▪ Switch ▪ Case ▪ Break ▪ Nesting ▪ Compound statement { } **Alternative algorithm solutions with different decisions structures*	▪	▪ Java Essentials: Chapter 5 ▪ Exposure Java	▪ Quizzes ▪ Programs ▪ Decisions: - single and double alternatives - switch - nesting ▪ Unit test	Weeks 12-147

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UNIT 7: Loops

Topics	Objectives	Resources	Assessments	Timeline
▪ Iteration ▪ Lcv ▪ Initialization ▪ Loop condition ▪ Update ▪ Loop body ▪ While loop: general purpose loop ▪ Do/while: - post test ▪ For loop: - fixed repetition - heading ▪ Infinite loop ▪ Off by one error ▪ Nested loops: - nesting decisions in loops and loops in decisions ** *Alternative algorithm solutions with different iteration structures* ** *Testing and comparing efficiency among algorithm alternatives*	▪	▪ Java Essentials: Chapter 6 ▪ Exposure Java	▪ Quizzes ▪ Programs: - summation - factorial - fibonnacci ▪ Unit test	Weeks 15-17

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UNIT 8: Interfaces

Topics	Objectives	Resources	Assessments	Timeline
▪ Array lists: - dynamic allocation - index - add - get - set - remove methods - type casting objects - wrapping primitive data types ▪ Arrays: - static allocation - alias - array copy - clone - parallel arrays * *Alternative algorithm solutions with different data structures*	▪	▪ Java Essentials: chapter 13 ▪ Exposure Java	▪ Quizzes ▪ Programs ▪ Unit tests	Weeks 24-26

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UNIT 11: GridWorld Parts 1-4

Topics	Objectives	Resources	Assessments	Timeline
▪ Large program development ▪ Introduction with narrative ▪ Interaction of classes: - bug - runner - critter - grid interface - extend classes (critter)	▪	▪ GridWorld, narrative and code	▪ Quizzes ▪ Programs ▪ Case study exercises ▪ Test	Weeks 21-23

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UNIT 12: Searching and Sorting

Topics	Objectives	Resources	Assessments	Timeline
▪ Traverse ▪ Sequential search ▪ Binary search ▪ Sequential sort ▪ Bubble sort ▪ Quick sort ▪ Merge sort ** *Alternative algorithm solutions, Big-O notation* ** *Testing and comparing efficiency among algorithm alternatives*	▪	▪ Java Essentials: chapter 13 ▪ Exposure Java	▪ Quizzes ▪ Programs ▪ Unit test	Weeks 27-28

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UNIT 13: Recursion

Topics	Objectives	Resources	Assessments	Timeline
▪ Front loaded ▪ Back loaded ▪ Mutual recursions *Recursion efficiency *vs. iteration algorithms* **Alternative algorithm solutions with different data structures*	▪	▪ Java Essentials: chapter 13 ▪ Exposure Java	▪ Quizzes ▪ Programs ▪ Unit test	Week 29

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UNIT 18: Exam Review

Topics	Objectives	Resources	Assessments	Timeline
▪	▪	▪ Java Essentials chapter 13 ▪ Exposure Java ▪ Review, Horowitz ▪ Be Prepared, Litvin	▪ Quizzes ▪ Practice tests Part I ▪ Free-response questions: - previous AP questions - layered method writing	Weeks 30-32

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UNIT 19: Final Project

Topics	Objectives	Resources	Assessments	Timeline
▪	▪	▪	▪ Final project - design ▪ Classes - driver - abstracts - pre and post conditions - implementation - execution	Weeks 34-38