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| AP Computer Science  |
| Description  The Advanced Placement Computer Science Course offers advanced students an opportunity to complete college-level work in high school. Utilizing the Java programming language, the course provides an introduction to the fundamental concepts of object based analysis (OOA), design (OOD), and programming (OOP), and how object-oriented languages differ from procedural languages. Students will work on a wide variety of interesting and challenging problems that will be used as a context to focus on problem solving skills and higher level thinking. The topics covered include: the concepts of abstraction, encapsulation, modularity, inheritance, analysis of algorithms and polymorphism. The course will focus on CS-1 material (A curriculum). Students are expected to take the AP test in May. |
| Course Overview |
| Course GoalsStudents should:* Design and implement solutions to problems by writing, running, and debugging computer programs.
* Use and implement commonly used algorithms and data structures.
* Develop and select appropriate algorithms and data structures to solve problems.
* Code fluently in an object-oriented paradigm using the programming language Java. Students are expected to be familiar with and be able to use standard Java library classes from the AP Java subset.
* Read and understand a large program consisting of several classes and interacting objects. Students should be able to read and understand a description of the design and development process leading to such a program.
* Recognize the ethical and social implications of computer use.
 | Essential Questions * What is the value of computers in today's society?
* What are the strengths and limitations of computers?
* How does software affect our lives?
* How do we breakdown a problem?
 | Assessments* Common Assessments
* AP Exam in May
* Case Study (College Board)
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|  Content Outline 1. Unit 1 – Object-Oriented Program Design
2. Unit 2 - Program Implementation
3. Unit 3 – Program Analysis
4. Unit 4 – Standard Data Structures
5. Unit 5 – Standard Algorithms
6. Unit 6 – Computing Context
 | Standards[State of Connecticut Curriculum Frameworks](http://www.sde.ct.gov/sde/cwp/view.asp?a=2618&q=320866)Connecticut State Standards are met in the following areas: CCRST2: Key Ideas and DetailsCCRST4: Craft and StructureCCRST7: Integration of Knowledge and IdeasCCRST9: Integration of Knowledge and IdeasCCWHST1: Text Types and PurposesCCWHST2: Text Types and PurposesCCWHST4: Production and Distribution of WritingCCWHST8: Research to Build and Present KnowledgeCCWHST9: Research to Build and Present Knowledge | Grade Level SkillsStudents will:* Evaluate information and synthesize a conclusive belief.
* Use analytical skills and support conclusions with specificity.
* Access and research information using the Internet.
* Display creative thinking, problem solving, and decision making.
* Organize and maintain files.
* Use computers to process information.
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| **Pacing Guide**  |
| 1st Marking Period  | 2nd Marking Period  | 3rd Marking Period | 4th Marking Period  |
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| Month 1-2 | Month 3-4 | Month 5-6 | Month 7-8 | Month 9 -10 |

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| Unit 1Object-Oriented Program Design 6 weeks | Unit 2Program Implementation 6 weeks  | Unit 3 Program Analysis 8 weeks | Unit 4Standard Data Structures 6 weeks | Unit 5Standard Algorithms 8 weeks | Unit 6Computing Context8 Weeks |

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| Unit 1 - Object-Oriented Program Design, 6 weeks, [top](#_top)  |
| Standards21st Century Skills Crosswalk1. Use real-world digital and other research tools to access, evaluate and effectively apply information appropriate for authentic tasks.2. Work independently and collaboratively to solve problems and accomplish goals.3. Communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes.Connecticut Career and Technical Education – Computer Information Systems*Content Standard 1 – Impact on Society** Assess the impact of information technology in a global society.

*Content Standard 7 - Networking, Infrastructure, and Security Develop skills for networking and security.** Design hardware and software network security solutions
* Distinguish among network environments (e.g., peer-to-peer, client server, thin client, n-tier, Internetworks, intranets, extranets).

National Standards: Information Technology*XI. Programming and Application Development:** Achievement Standard: Design, develop, test, and implement programs

*X. Systems Analysis and Design** Achievement Standard: Analyze and design information systems using appropriate development tools
 |
| Unit ObjectivesStudents will be able to:1. Program Design
* Read and understand problem description, purpose, and goals.
* Apply data abstraction and encapsulation.
* Understand and implement a given class hierarchy
* Identify reusable components from existing code using classes and class libraries.
1. Class design
* Design and implement a class.
* Choose appropriate data representation and algorithms.
* Apply functional decomposition.
* Extend a given class using inheritance.
 | Focus Questions* What is the value of computers in today's society?
* What are the strengths and limitations of computers?
* How does software affect our lives?
* How do we breakdown a problem?
 | Assessment* Project
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| Skill Objectives Students will:* Apply information they have read on their own to the topics at hand.
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| Technology Resources * Computers
* Internet
* Projector or Interactive Whiteboard
 | Suggested Materials/Resources * Textbook
* Appropriate websites and video tutorials

Relevant News Articles or Videos |

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| Unit 2 – Program Implementation, 6 weeks [top](#_top) |
| Standards21st Century Skills Crosswalk1. Use real-world digital and other research tools to access, evaluate and effectively apply information appropriate for authentic tasks.2. Work independently and collaboratively to solve problems and accomplish goals.3. Communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes.Connecticut Career and Technical Education – Computer Information Systems*Content Standard 1 – Impact on Society** Assess the impact of information technology in a global society.

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| Unit ObjectivesStudents will be able to:1. Complete Implementation Techniques:
2. Methodology
* Object-oriented development
* Top-down development
* Encapsulation and information hiding
* Procedural abstraction
1. Programing Constructs

1. Primitive types vs. objects2. Declaration* Constant Declarations
* Variable Declarations
* Class Declarations
* Interface Declaration
* Method Declarations
* Parameter Declarations
 | Focus Question* What is the value of computers in today's society?
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.  | Assessments * Project
 |
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| Unit 3 – Program Analysis, 8 weeks [top](#_top) |
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| Unit ObjectivesStudents will be able to:1. Perform testing: test classes and libraries in isolation, identify boundary cases and generate appropriate data as well as, perform integration testing.
2. Preform debugging: categorize errors: compile-time, run-time, and logic; identify and correct errors; and employ techniques such as using a debugger, adding extra output statements, or hand tracing code.
3. Understand and modify existing code.
4. Extend existing code using inheritance.
5. Understand error handling and run-time exceptions.
6. Reason about programs(e.g. pre and post-conditions, assertions)
7. Analysis of algorithms – informal comparisons of running times and exact calculation of statement execution counts.
8. To complete numerical representations and limits using representations of numbers in different bases and limitations of finite representations.
 | Focus Questions * What are the strengths and limitations of computers?
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 | Assessments * Project
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| Unit 4 – Standard Data Structures, 6 weeks [top](#_top) |
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| Unit ObjectivesStudents will be able to:Complete the following Data Structures: * Simple data types
* Classes
* Lists
* Arrays
 | Focus Questions * What are the strengths and limitations of computers?
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 | Assessments * Project
 |
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| Unit 5 – Standard Algorithms, 8 weeks [top](#_top) |
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 |
| Unit ObjectivesStudents will be able to:1. Complete operations on data structures previously listed – Traversals, Insertions, Deletions
2. Search- Sequential and Binary
3. Sort – Selection, Insertion, and Mergesort.
 | Focus Questions * What are the strengths and limitations of computers?
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* How do we breakdown a problem?
 | Assessments * Project
* Case Study
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|  | Skill Objectives Students will:* Apply information they have read on their own to the topics at hand.
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| Unit 6 – Computing Context, 8 weeks [top](#_top) |
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National Standards: Information TechnologyXIV. Security, Privacy, and Risk Management* Achievement Standard: Design and implement security, privacy, and risk management policies and procedures for information technology.

XV. Ethical and Legal Issues* Achievement Standard: Describe, analyze, develop, and follow policies for managing ethical and legal issues in organizations and in a technology-based society
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| Unit ObjectivesStudents will be able to:Identify and explain the ethical and social implications of:* System Reliability
* Privacy
* Legal issues and intellectual property
* Social and ethical ramifications of computer use
 | Focus Questions * What are the strengths and limitations of computers?
* How does software affect our lives?
* How do we breakdown a problem?
 | Assessments * Project
* Case Study
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Use computers to process information |
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