Odysseyware®

CURRICULUM OVERVIEW

Introduction to Computer Science

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Introduction to Computer Science Course Overview

Computers are an integral part of many of our lives and help us to accomplish many different tasks. Computer science careers are one of the fastest growing careers in the world and certainly in the United States. Educating students about careers in computer science is beneficial to both students our global marketplace. In this course students will see and experience much of what computer scientists do. They will start programming in the first unit and continue throughout the course. They will also explore the hardware and software that make computers work. Projects are assigned throughout the course that allow students to not only write programs, but to design networks, plan a mobile app for a smartphone, analyze big data, and more. Students who complete the course will know how to address accessibility issues to make the Internet accessible to all, how to help protect themselves from security threats, make informed decisions based on ethical and legal issues, and learn skills to use when working with a diverse team. Not only will students explore the wide spectrum of computer science careers, but they will also survey the history of computers and explore emerging technologies and issues.

- **Unit 1: Computer Science Then and Now:** Computers have had an enormous impact on social, ethical, economic, and cultural issues. Students will examine how computers developed and technologies that are just now being developed. Telehealth is changing how doctors deliver care. Virtual and augmented reality allow people to experience adventures and training without leaving home. Students will also gain a working knowledge of a computer and begin programming in Python, which is a free, open-source Integrated Design Environment. Flowcharts and pseudocode are used to plan how to solve a problem. Students will also investigate five computer science fields to help them begin thinking about career paths.

- **Unit 2: Hardware and Software:** Have you thought about how computers communicate? Computers communicated in ones and zeros, so all information has to be translated to binary. Then the signal has to be transmitted through a network. Students will explore how the World Wide Web began and how networks are organized. They will also investigate the software that makes computers useful and the ways information is stored.

- **Unit 3: Computational Thinking:** A high-level program such as Python allows students to write code that is very readable. Variables are used to store numbers, text, and other data types. Students will write programs that ask for user input, process the response, and display the result. They will make decisions that allow the response to fit the data provided. As programs become more complex, the importance of planning rises. Students will plan, implement, and test programs. They will also examine difficulties faced by those with mental and physical challenges and identify solutions.

- **Unit 4: Control Structures and Data Types:** Programs can be made more efficient in several ways. Programming languages use loops to perform repetitive tasks. Functions enable programmers to reuse code in many applications. Large amounts of data can be organized into collections, such as lists, tuples, and dictionaries. Students will create their own user-defined data type. Every programmer makes mistakes and users often make mistakes when entering data. Error handling provide a built-in mechanism of dealing with user errors and preventing programs from crashing.

- **Unit 5: Classes, Analyzing Data, and Arrays:** Object-oriented programming (OOP) increases efficiency and protects code contained in the object. OOP is the computer version of reduce-reuse-recycle. Classes and libraries enable programmers to use the work already done by themselves or other programmers. The math, random, and other libraries are used. In this unit students will also explore real-world data and write a guessing game program.

- **Unit 6: Semester Review and Exam:** Students will prepare for and take the semester exam.

- **Unit 7: Programming Algorithms:** Up to this point, once a program was finished the information was not saved. In this unit the student will be able to save the output of a program in files. Being able to read from and write to files allow you to analyze vast quantities of real-world data. Another aspect of real-world programming is gathering and responding to customer feedback. Students will use string formatting and color choices to make a program's output

more readable for greater accessibility. Programming is not an end in itself. Students will investigate how algorithms are used in different disciplines and examine how other programming languages are used.

- **Unit 8: Design and Development:** The Software Development Life Cycle (SDLC) models the stages of software development: planning, design, coding, testing, release, and maintenance. Students will design, code, and test applications such as web pages, a guessing game that uses the random library, and learn the best practices for working alone and with a team. They examined a variety of development tools such as those used to create mobile apps and how VPython can model physical phenomena. They will also consider how versioning is used during the maintenance phase.

- **Unit 9: Laws and Security:** Laws are critical to those who use and work with computers. Intellectual property laws protect writers, programmers, artists, and other creators of original work. Cybersecurity issues demand tradeoffs between safety and usability. The damage done by hackers and the cost of security measures have a huge economic impact. Students will write a program to evaluate the strength of a password and conduct independent research into legal and security issues.

- **Unit 10: Ethics:** Ethics are even more important than legal issues. What is legal is not always ethical. Students will explore bias and equity, ethics, and online etiquette. They will identify sources of bias for the physically and mentally challenged and strategies for addressing that bias. In some countries, the government controls the information available on the Internet, a form of information censorship. Economic conditions can limit access to the Internet. Diversity is addressed by examining how cultural differences affect members of a team.

- **Unit 11: Applications:** This unit explores a variety of ways computers are used and ways students can find a career in the field. The unit begins with learning more about web design, two styles of programming, and how music and video are represented on a computer. Students will write a program to create art. In the project, students will design a mobile app, get feedback from others, and improve their design. They will also implement a game that uses artificial intelligence. The unit ends with workplace topics: being the kind of worker others want to work beside, being safe in the workplace, providing customer service, and exploring the preparation needed for a computer science career.

- **Unit12: Semester Review and Exam:** Students will prepare for and take the semester exam.

- **Unit 13: Final Review and Exam:** Students will prepare for and take the final exam.

Unit 1: Computer Science Then and Now

Assignments

1.	Course Overview	13.	Computer Scientists
2.	The Big Picture	14.	Quiz 3: Planning and Changes
3.	Where are We Going?	15.	Five Computer Science Fields
4.	Where Did it Get Started?	16.	Scalability
6.	Computer Terminology	17.	Career Spotlight: Ada Lovelace
8.	Program Execution	18.	Quiz 4: Scalability and Computer Scientists
9.	Quiz 2: Computer Terminology and Python Installation	19.	Review: Computer Science Then and Now
10.	Do You Have a Plan?	20.	Test: Computer Science Then and Now
11.	Project: Make a Plan	21.	Glossary and Credits
12.	How Computers Have Changed Your World		

Unit 2: Hardware and Software

Assignments

1.	Binary World	13.	Quiz 3: Network Types and Operating Systems
2.	How Do We Communicate?	14.	Software
3.	Quiz 1: Bits and Communication	15.	File Types and Storing Programs
4.	The WWW	16.	Choosing Hardware and Software
6.	Computer Networking Basics	17.	Project: Network Design
8.	Network Protocol	18.	Career Spotlight: Grace Murray Hopper
9.	Quiz 2: Networks	19.	Quiz 4: File Types. Hardware, and Software
10.	Transmitting Data	20.	Review: Hardware and software
11.	Local Versus Wide Area	21.	Test: Hardware and software
12.	Operational Systems	22.	Glossary and Credits

Unit 3: Computational Thinking

Assignments

1.	Abstracts	13.	Quiz 3: Accessibility and Strings
2.	Data Types	14.	Design Specifications
3.	Manipulating Data Types	15.	Computational Models
4.	Quiz 1: Data Types and Operations	16.	Math and Computer Science Connections
6.	Variables and Numerical Operations	17.	Project: Programming a Math Algorithm
8.	Input and Output	18.	Career Spotlight: Bill Gates
9.	Making Decisions	19.	Quiz 4: Design and Computational Models
10.	Quiz 2: Input, Output, and Making Decisions	20.	Review: Computational Thinking
11.	Accessibility	21.	Test: Computational Thinking
12.	Manipulating Strings	22.	Glossary and Credits

Unit 4: Control Structures and Data Types

Assignments

1.	For Loops	13.	Dictionaries
2.	While Loops	14.	Quiz 3: Tuples and Dictionaries
3.	Nested Loops	15.	User-Defined Data Types
4.	Quiz 1: Loops and Functions	16.	Finding and Handling Errors
6.	Using Functions	17.	Project: Math Tutor Program with Error Handling
8.	Scope and Parameters	18.	Career Spotlight: Donald Knuth
9.	Lists	19.	Quiz 4: User-Defined Data Types and Error Handling
10.	Quiz 2: Scope and Lists	20.	Review: Control Structures and Data Types

11.	Collections	21.	Test: Control Structures and Data Types
12.	Tuples	22.	Glossary and Credits

Unit 5: Classes, Analyzing Data, and Arrays

Assignments

1.	Classes	13.	Multidimensional Arrays
2.	Class Structure	14.	Quiz 3: Sorting and Arrays
3.	Implementing Object-Oriented Programming	15.	Analyzing Data
4.	Quiz 1: Classes	16.	Project: Big Data Research Project
6.	The Python Standard Library	17.	Guessing Game
8.	Math Functions	18.	Career Spotlight: Alvy Ray Smith
9.	Searching	19.	Quiz 4: Analyzing Data and Games
10.	Quiz 2: Functions and Searching	20.	Review: Classes, Analyzing Data, and Arrays
11.	Sorting	21.	Test: Classes, Analyzing Data, and Arrays
12.	Arrays	22.	Glossary and Credits

Unit 6: Semester 1 Review and Exam

Assignments

1.	Semester 1 Review: Introduction to Computer Science
2.	Semester 1 Exam: Introduction to Computer Science

Unit 7: Programming Algorithms

Assignments

1.	Reading a File	13.	Refining Your Program
2.	Writing to a File	14.	Programming Across Disciplines
3.	Searching Complex Data	15.	Quiz 3: Events and Customers
4.	Project: Big Data Programming	16.	Other Languages
6.	Quiz 1: Reading, Writing, and Searching a File	17.	String Formatting
8.	Analyzing Images	18.	Career Spotlight: George Lucas
9.	Evaluating Your Program	19.	Quiz 4: Language and String Formatting
10.	Using Events	20.	Review: Programming Algorithms
11.	Quiz 2: Analyzing Images and Program Evaluation	21.	Test: Programming Algorithms
12.	Customer Relations	22.	Glossary and Credits

Unit 8: Design and Development

Assignments

1.	The Software Development Process	13.	Visual Python
2.	Using the Internet	14.	Quiz 3: Platforms and Licensing
3.	Can Anything Be Random?	15.	VPython Applications
4.	Quiz 1: Software Development, the Internet, and Randomness	16.	Global Connections
6.	Create a Game	17.	Project: Design and Development
8.	Managing a Team	18.	Career Spotlight: Steve Sfartz
9.	Best Practices	19.	Quiz 4: VPython and Global Connections
10.	Quiz 2: Designing a Game and Teams	20.	Review: Design and Development
11.	Multiple Computing Platforms	21.	Test: Design and Development
12.	The License Police	22.	Glossary and Credits

Unit 9: Laws and Security

Assignments

1.	Intellectual Property Law	13.	Solutions to Security Issues
2.	Privacy Concerns	14.	Quiz 3: Workplace Crime and Hackers
3.	Malware	15.	Write Password Evaluator
4.	Quiz 1: Intellectual Property, Privacy, and Malware	16.	How "Useless" Math Research Made the Internet Safer
6.	Cybersecurity Measures	17.	Project: Research Project
8.	Media Reliability Concerns	18.	Career Spotlight: Peter Norton
9.	Impact of Cybercrime	19.	Quiz 4: Security Solutions
10.	Quiz 2: Cybersecurity and Media Reliability	20.	Review: Laws and Security
11.	Workplace Crime	21.	Test: Laws and Security
12.	Hackers and Unauthorized Access	22.	Glossary and Credits

Unit 10: Ethics

Assignments

1.	Digital Citizenship	13.	Emerging Ethical Issus
2.	Bias and Equity	14.	Quiz 3: Collaboration Ethics and Information Censorship
3.	Ethics	15.	Cultural Differences in a Team
4.	Quiz 1: Digital Citizenship, Bias, Equity, and Ethics	16.	Project: Programming as a Team
6.	Social Networking Issues	17.	Online Education Issues
8.	Digital Etiquette	18.	Career Spotlight: Cheiko Asakawa
9.	Global Information Concerns	19.	Quiz 4: Emerging Ethical Issues
10.	Quiz 2: Social Issues and Global Concerns	20.	Review: Ethics
11.	Collaboration Ethics	21.	Test: Ethics
12.	Information Censorship	22.	Glossary and Credits

Unit 11: Applications

Assignments

1.	Web Programming	13.	Project: Create a Mobile App
2.	Block Programming	14.	Would You Want to Work with You?
3.	Pair Programming	15.	Quiz 3: Mobile Apps and Work Readiness
4.	Quiz 1: Programming Methods	16.	Should You Work Here?
6.	Music and Video Files	17.	Project: You Are Tech Support
8.	Python Art	18.	Career Organizations
9.	Application and Program Interfaces	19.	Career Spotlight: Preparing for a Computer Science Career
10.	Quiz 2: Media and APIs	20.	Quiz 4: Careers
11.	Can You Beat the Computer?	21.	Review: Applications
12.	Mobile Applications	22.	Test: Applications
		23.	Glossary and Credits

Unit 12: Semester 2 Review and Exam

Assignments

1.	Semester 2 Review: Introduction to Computer Science
2.	Semester 2 Exam: Introduction to Computer Science

Unit 13: Final Exam
Assignments
1.   Course Review: Introduction to Computer Science
2.   Final Exam: Introduction to Computer Science

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(*) Indicates alternative assignment