Introduction to Computer Science	Scope and Sequence
Unit Lesson	**Objectives**
COMPUTER SCIENCE THEN AND NOW	
Before You Begin	
The Big Picture	
	Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
Where Are We Going?	
	Discuss computational innovations.
	Describe Moore's Law.
Where Did It Get Started?	
	Analyze a historical timeline of computers and technology.
Computer Terminology	
	Define key computing terms.
	Distinguish between memory and space.
Let's Get Started	
	Write and save simple Python programs
Program Execution	
	Explain the program execution process.
	Identify the expected output of a program.
Do You Have a Plan?	
	Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests.
Project: Make a Plan	
	Create a flowchart and/or pseudocode to express a problem or idea as an algorithm.

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	How Computers Have Changed Your World	
		Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
	Computer Scientists	
		Identify key scientists and groups who contributed to the development of computers.
	Five Computer Science Fields	
		Compare and contrast the five disciplines of computing.
		Identify a computer science career in a nontraditional computer science industry for each of the five computing disciplines.
	Scalability	
		Describe issues with scalability in programming and in web applications.
	Review: Computer Science Then and Now	
	Test: Computer Science Then and Now	
HARDWARE AND SOFTWARE		
	Binary World	
		Describe how a high-level program such as Python or Java is converted to binary and executed.
	How Do We Communicate?	
		Identify traditional means of transmitting information in the original computers.
		Identify recent advances in how information is transmitted.
	Computer Networking Basics	
		Identify the basic components of computer networks.
	The WWW	

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		Describe the components of the Internet.
		Describe the causes of Internet breakdowns and page failures.
	Network Protocol	
		Describe client-server, peer-to-peer, SMTP, POP, IMAP, Telnet, SSH, FTP, TCP, and domain name.
	Transmitting Data	
		Describe the path of a packet of data.
		Identify causes of data loss.
	Local versus Wide Area	
		Define LAN and WAN.
		Distinguish between the strengths of LAN vs. WAN.
	Operating Systems	
		Demonstrate knowledge and appropriate use of different operating systems.
		Categorize and describe the different functions of operating system software.
	Software	
		Describe issues related to multiple platforms, such as a desktop, tablet, and smartphones.
		Describe some of the tools used to create smartphone apps.
	File Types and Storing Programs	
		Define common file types.
		Explain factors influencing the choice of a particular file type for different types of media.
	Choosing Hardware and Software	
		Develop criteria for selecting appropriate hardware and software when solving a specific real-world problem (such as business, educational, personal).
		Identify strategies for identifying and solving routine hardware and software problems that occur in everyday life.

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	Project: Network Design	
		Design a computer network for a small business or school.
	Review: Hardware and Software	
	Test: Hardware and Software	
COMPUTATIONAL THINKING		
	Abstractions	
		Explain how abstractions hide the underlying implementation details of computing systems embedded in everyday objects.
	Data Types	
		Apply the basic operations used with numeric and non-numeric data types in developing programs.
		Differentiate between text and numerical data.
	Manipulating Data Types	
		Convert from one data type to another.
		Manipulate and interpret data.
	Variables and Numerical Operators	
		Use variables to store data.
		Write and evaluate numerical expressions.
	Input and Output	
		Write and interpret statements that allow data input by the user.
		Write and interpret statements that output information.
	Making Decisions	
		Define and use boolean data.
	Accessibility	

Unit	Lesson	Objectives
		Identify difficulties faced by those with physical or mental challenges.
		Identify solutions for those with physical or mental challenges.
	Manipulating Strings	
		Manipulate strings using loops, slicing, locating a value within a string, and by formatting the string.
	Design Specifications	
		Plan a program to gather data from the user, make decisions, and provide output based on the input.
	Computational Models	
		Implement the plan for a program to gather data from the user, make decisions, and provide output based on the input.
		Plan, create, and interpret a program to calculate the BMI and assign status.
	Math and Computer Science Connections	
		Identify connections between mathematics and computer science.
	Project: Programming a Math Algorithm	
		Write a program to solve a math problem.
	Review: Computational Thinking	
	Test: Computational Thinking	
CONTROL STRUCTURES AND DATA TYPES		
	For Loops	
		Describe the syntax and use of a for loop.
		Interpret for loops.
	While Loops	
		Describe the syntax and use of a while loop.

Unit	Lesson	Objectives
		Interpret while loops.
		Compare and contrast a for and a while loop.
	Nested Loops	
		Write and interpret nested loops.
	Using Functions	
		Describe the syntax and use of functions.
		Write and interpret functions.
	Scope and Parameters	
		Define and use parameters.
		Define and interpret scope of a variable.
	Lists	
		Identify how lists can be used to handle and organize large amounts of data.
		Manipulate lists to store, retrieve, and organize data.
	Collections	
		Identify how collections can be used to handle and organize large amounts of data.
		Manipulate collections to store, retrieve, and organize data.
	Tuples	
		Identify how tuples can be used to handle and organize large amounts of data.
		Manipulate tuples to store, retrieve, and organize data.
	Dictionaries	
		Identify how dictionaries can be used to handle and organize large amounts of data.
		Manipulate dictionaries to store, retrieve, and organize data.

Unit	Lesson	Objectives
	User-Defined Data Types	
		Describe user-defined data types.
		Create and manipulate user-defined data types.
	Finding and Handling Errors	
		Identify standard types of errors.
		Catch and handle standard types of errors.
	Project: Math Tutor Program with Error Handling	
		Plan and create a program to practice math facts with error handling.
	Review: Control Structures and Data Types	
	Test: Control Structures and Data Types	
CLASSES, ANALYZING DATA, AND ARRAYS		
	Classes	
		Describe classes.
		Create and manipulate simple classes.
	Class Structure	
		Describe and interpret member functions.
		Describe and interpret the scope of a variable.
	Implementing Object-Oriented Programming	
		Create and manipulate objects created from a class.
		Explain object-oriented programming as related to classes.

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	The Python Standard Library	
		Use the import statement to use built-in modules.
		Use the built-in Python libraries to create objects.
	Math Functions	
		Explain the built-in math functions.
		Interpret statements using built in math functions.
	Searching	
		Describe a linear search.
		Describe a binary search and identify when it is the better choice.
	Sorting	
		Describe an algorithm that sorts data Identify code fragments that will successfully sort data.
		Identify code fragments that will successfully sort data.
	Arrays	
		Describe and manipulate a one-dimensional array.
		Sort and search an array.
	Multidimensional Arrays	
		Describe and manipulate multidimensional arrays.
	Analyzing Data	
		Compare and contrast data sets that could be used to explore a real-world phenomenon or support a claim.
	Project: Big Data Research Project	
		Write a scientific report modeling a written research paper on big data applications.
	Guessing Game	

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		Plan, create, and interpret a guessing game programming using a random number generator.
	Review: Classes, Analyzing Data, and Arrays	
	Test: Classes, Analyzing Data, and Arrays	
SEMESTER 1 REVIEW AND EXAM		
	Semester 1 Review: Introduction to Computer Science	
	Semester 1 Exam: Introduction to Computer Science	
PROGRAMMING ALGORITHMS		
	Reading a File	
		Describe features of a text file.
		Read from a text file.
	Writing to a File	
		Write data to a text file.
		Explain variations on how to write to a data file.
	Searching Complex Data	
		Search for information in a text file.
		Describe ways to organize data written to a text file.
	Project: Big Data Programming	
		Write a scientific report modeling a written research paper on big data applications.
	Analyzing Images	
		Describe how images are stored digitally.

Unit	Lesson	Objectives
		Describe how programs can alter images.
	Evaluating Your Program	
		Use various debugging and testing methods to ensure program correctness.
		Explain how a program functions.
		Assess a program by testing to verify correct behavior.
	Using Events	
		Describe event-driven programming.
	Customer Relations	
		Describe methods of gathering customer feedback.
		Explain how customer feedback can be addressed.
	Refining Your Program	
		Use customer feedback to refine an existing program in order to reach a broader audience and address a bias issue.
	Programming across Disciplines	
		Explain how an algorithm can be applied to different disciplines.
	Other Languages	
		Explain how an algorithm can be applied to different disciplines.
	String Formatting	
		Use string formatting to improve the quality of the output.
	Review: Programming Algorithms	
	Test: Programming Algorithms	
DESIGN AND DEVELOPMENT		
	The Software Development Process	

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		Describe the software life cycle.
		Describe a software development process used to solve software problems (e.g., design, coding, testing, verification).
	Using the Internet	
		Describe how web pages are developed and how programming can be used to implement the goals of a website.
	Can Anything Be Random?	
		Describe random number generation.
		Analyze random number generation.
	Creating a Game	
		Write a computer guessing game using random numbers, looping, and decision-making.
		Apply guidelines for identifying and fixing errors.
	Managing a Team	
		Describe collaborative methods in problem solving of level-appropriate complexity
		Decompose a programming solution into tasks that can be assigned to team members
		Define a nondisclosure agreement
	Best Practices	
		Describe best practices of digital design (comments, documentation, etc.).
		Identify flaws related to a failure to use best practices.
	Multiple Computing Platforms	
		Describe how a program can be modified to work on multiple platforms.
		Describe tools used for creating mobile apps.
	The License Police	
		Describe licensing.

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Unit	**Lesson**	**Objectives**
		Describe version control.
	Visual Python	
		Describe graphing features of Visual Python.
		Interpret Visual Python code fragments.
	VPython Applications	
		Plan, create, and interpret a program that moves a ball.
	Global Connections	
		Describe ways in which a program could be designed to address cultural issues.
		Identify issues that can arise when designing a solution for a global audience.
	Project: Design and Development	
		Choosing a topic from the unit, write a report outlining a problem or issue, who it affects, and how it can be resolved.
	Review: Design and Development	
	Test: Design and Development	
LAWS AND SECURITY		
	Intellectual Property Law	
		Define intellectual property rights.
		Describe potential benefits and harmful effects related to intellectual property rights.
	Privacy Concerns	
		Identify sources of privacy concern.
		Identify problems related to the collection of private data through automated processes.
	Malware	
		Define malware.

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		Identify problems caused by malware.
		Identify ways to protect against malware.
	Cybersecurity Measures	
		Explain cybersecurity.
		Explain the tradeoff between cybersecurity measures and usability.
	Media Reliability Concerns	
		Describe the risks associated with the utilization and implementation of digital media reliability.
		Identify measures to address digital media reliability.
	Impact of Cybercrime	
		Explain the national and global economic impact of cybercrime.
		Identify measures to address cybercrime at the global level.
	Workplace Crime	
		Identify major causes of work-related incidents in office environments, both intentional and unintentional.
		Explain security measures in an office/work environment in terms of efficiency, feasibility, and ethical impacts.
	Hackers and Unauthorized Access	
		Explain how hackers work.
		Compare ways software developers protect devices and information from unauthorized access.
	Solutions to Security Issues	
		Describe digital solutions to security threats, such as encryption and firewalls.
		Describe physical security measures.
	Write Password Evaluator	
		Plan, create, and interpret a program to evaluate the strength of a password.

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Unit	**Lesson**	**Objectives**
	How "Useless" Math Research Made the Internet Safer	
		Describe RSA encryption.
	Project: Research Project	
		Choosing a topic from the unit, write a report outlining a problem or issue, who it affects, and how it can be resolved.
	Review: Laws and Security	
	Test: Laws and Security	
ETHICS		
	Digital Citizenship	
		Describe digital citizenship.
		Identify components of a digital footprint (e.g., active and passive data) and its lasting impact.
	Bias and Equity	
		Identify sources of bias when developing computational artifacts, including those who are physically and mentally challenged.
		Describe strategies for addressing bias and equity issues.
	Ethics	
		Describe ethical and legal practices of safeguarding the confidentiality of business- and personal-related information.
		Examine the consequences resulting from issues involving ethics around security, privacy, copyright, fair use, intellectual property, social media, and licensing.
		Discuss the ethical and appropriate use of computer devices.
	Social Networking Issues	
		Compare appropriate and inappropriate social networking behaviors.
		Describe the effects associated with the use of social media (e.g., hiring, incarceration, termination).

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	Digital Etiquette	
		Describe proper netiquette when using email, social media, and other technologies for communication purposes.
		Select the most appropriate means of communication for given situations (e.g., personal versus professional communication, communication with teachers and employers).
		Explain the importance of Acceptable Use Policies.
	Global Information Concerns	
		Describe the impact of global information sharing on the delivery of news, the reliability of information, and personal freedom.
	Collaboration Ethics	
		Describe issues that might arise when collaborating across cultures.
		Describe strategies for addressing issues related to collaboration across cultures.
	Information Censorship	
		Describe how access to digital information is limited in some regions.
		Describe strategies for addressing information censorship.
	Emerging Ethical Issues	
		Explain the potential impacts and implications of emerging technologies on larger social, economic, and political structures, with evidence from credible sources.
	Cultural Differences in a Team	
		Discuss how cultural practices can affect how members of a global team interact.
	Project: Programming as a Team	
		Decompose a project into assignments for members of a team.
	Online Education Issues	
		Discuss ethical and equity issues specific to the use of the internet in education.
	Review: Ethics	

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Unit	**Lesson**	**Objectives**
	Test: Ethics	
APPLICATIONS		
	Web Programming	
		Describe how web pages are created using HTML elements such as hyperlinks lists, images, and headings.
	Block Programming	
		Describe visual block-based programming.
	Pair Programming	
		Describe how pair programming can be used to plan and implement a program.
	Music and Video Files	
		Describe how sounds/songs and video are digitized and represented in a computer.
	Python Art	
		Create a drawing application.
	Application Program Interfaces	
		Describe how application program interfaces (APIs) function.
	Can You Beat the Computer?	
		Implement an artificial intelligence algorithm to play a game against a human opponent or solve a problem.
	Mobile Applications	
		Describe mobile app development using mock-up screens and identifying input, process, and output steps for each screen.
	Project: Create a Mobile App	
		Create a mobile app plan using PowerPoint slides to show mock-ups of screens, identifying input, process, and output for each screen.
	Would You Want to Work with You?	

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Unit	**Lesson**	**Objectives**
		Describe work-readiness traits required for success as a computer programmer.
	Should You Work Here?	
		Describe safety and ethical issues in the work environment.
	Project: You are Tech Support	
		Respond to tech support scenarios using employment readiness skills.
	Career Organizations	
		Define career and technology student organizations and professional organizations.
		Describe potential benefits for joining a career and technology student organization or professional organization.
	Review: Applications	
	Test: Applications	
SEMESTER 2 REVIEW AND EXAM		
	Semester 2 Review: Introduction to Computer Science	
	Semester 2 Exam: Introduction to Computer Science	
FINAL EXAM		
	Course Review: Introduction to Computer Science	
	Final Exam: Introduction to Computer Science	