Indiana Computing Foundations for a Digital Age Syllabus

High School (75 Contact Hours)

Course Overview and Goals

Indiana Computing Foundations for a Digital Age is designed to introduce students to five major topics within computer science including computing systems, networks and the internet, data and analysis, algorithms and planning, and impacts of computing. The course introduces foundational computing concepts while building critical thinking, collaboration, problem-solving, and other important skills that are invaluable for life in a global and technologically advancing society.

Learning Environment

The course utilizes a blended classroom approach. The content is a mix of web-based and physical activities. Each module of the course is broken down into lessons. Lessons are composed of short video tutorials, interactive learning pages, quizzes, explorations, simulations, and free-response prompts. Each module ends with a comprehensive quiz or project that assesses students' mastery of that module's material.

More Information

Browse the content of this course at https://codehs.com/course/24106/overview

Prerequisites

The Indiana Computing Foundations for a Digital Age course is designed for beginners with no computer science background. It is highly visual, dynamic, and interactive, making it engaging for newcomers to computer science.

Technology Requirements

To complete all activities and exercises in this course, students must have access to the 3rd party sites and tools listed here: Computing Foundations for a Digital Age Course Links

Course Breakdown

Module 1: Cybersecurity and You (3 weeks/15 hours)

In this module, students delve into key areas such as personal data collection, the reliability of online information, cyber ethics and laws, personal data security, cybersecurity essentials, and strategies to combat common cyber threats and their prevention, equipping individuals with the knowledge to navigate the digital landscape responsibly and securely.

Topics Covered	• Digital Footprint and Responsibility • Personal Data Collection and Security • Cyber Ethics and Laws

	• Cybersecurity Essentials • Common Cyber Attacks and Prevention

Example Assignments	• Digital Footprint and Responsibility
	  ○ Students explore the impact of social media and technology on teenagers, covering topics like digital footprints, the rise of social media screenings, cyberbullying, and the importance of updating privacy settings.
	• Personal Data Collection and Security
	  ○ This lesson delves into the use and security of personal data, discussing how companies like Google utilize user information, the implications of location tracking, and legal aspects of privacy, and encourages critical thinking through reflections, checks for understanding, and explorations of browser security settings and the trade-offs of security measures.
	• Cyber Ethics and Laws
	  ○ This lesson navigates through cyber ethics, differentiating between ethics and laws, exploring legal consequences, copyright in education, the process of obtaining permissions, and the pros and cons of intellectual property laws.
	• Cybersecurity Essentials
	  ○ This lesson covers cybersecurity, featuring activities on the AAA Security Framework and the CIA Triad, along with exploring the impact of the Internet of Things on data security.

Module 2: Computing Systems (2 weeks/10-12 hours)

In this module, students will compare and contrast common operating systems (Windows, Linux, OS) and explain the importance of application security. They will investigate security options and implement user accounts to enforce authentication and authorization. Students will also demonstrate how to work with basic and advanced command prompts.

Topics Covered	• History of Computers • Operating Systems • Software and Applications • Application Security • System Administration

Example Assignments	• Mission: Who Invented the Computer?
	  ○ Explore the question “Who invented the computer?” by investigating key people or groups contributing to its development. As you go through each exhibit, you'll collect evidence and take notes to decide who you think the main inventor is, using guiding questions to support your thinking.
	• Software Licenses
	  ○ *Do I Need a Software License?:* You have built a new picture-taking app complete with new original filters for iOS phones and you are excited to start selling it in the app store! Brainstorm and create a

	software agreement for your new app. ● System Administration ○ *User Accounts:* You have been placed in charge of setting up your family's new computer. There should be four separate user groups - one for you and adult members of the family, one for your two middle school-aged siblings, a child account for your youngest sibling, and a guest account for family visitors.

Module 3: IT Concepts (2 weeks/10-12 hours)

In this module, students explore the structure and design of the internet and networks, and how this design affects the reliability of network communication, the security of data, and personal privacy. Students will learn how the Internet connects computers all over the world by use of networking protocols.

Topics Covered	● IP Addresses ● Routing and Packets ● Protocols: TCP, UDP, HTTP/HTTPS ● Impact of the Internet ● Internal Components of a Computer ● Peripheral Devices ● Network Devices ● Storage and Network Options ● Network Communication ● Network Management
Example Assignments	● Impact of the Internet ○ *Compass Points: The Internet:* In this activity, students use the Compass Points thinking routine to examine their feelings about the Internet and its impact on society. ● Network Options ○ *Wireless Network Setup:* In this activity, students will draw a diagram that represents a wireless network setup that will be implemented for a fictitious house, office, or apartment building. The teacher will either assign them a building or they can create one from their own imagination. ● Network Management ○ *SSH Logs:* Addison works as a server administrator and has been accused of stealing company financial data. He swears he is innocent. A search warrant has been granted for the company's network logs and you have been tasked with learning as much as possible about the attack and the attacker. Can you dig into the logs and help track down the hacker?

Module 4: Project: IT Professional (2 weeks/10 hours)

In this project, students will explore cybersecurity career pathways and build skills that will be needed within these fields such as communication. In this project, students will explore the troubleshooting methodology and utilize it to solve sample IT support issues.

Topics Covered	• Troubleshooting Methodology
	  ○ Identify the problem
	  ○ Research past solutions
	  ○ Establish a theory
	  ○ Test the theory
	  ○ Establish a plan of action
	  ○ Implement the solution
	  ○ Verify functionality
	  ○ Document findings
	• Cybersecurity Career Pathways
	• Customer Service and Communication
	• Contributing to a Knowledge Base
	• Creating an Instructional Video

Example Assignments	• *Troubleshooting:* In this project, students will learn more about each step of the troubleshooting methodology and use these steps to repair and improve faulty network systems.
	  ○ Poor Signal Strength
	  ○ Interference
	• *Act it out!:* Pair up with a partner and create a short script of a customer support scenario based on a common mobile device issue.
	• *Write a KB Article:* Create an internal knowledge base article that will be shared with other technicians.
	• *Star in a Video!:* Create a 2-5 minute video tutorial based on a common mobile device issue

Module 5: Python Fundamentals (3 weeks/15 hours)

Students learn the basics of programming by writing programs that interact with users through the keyboard.

Objectives / Topics Covered	• Printing • Variables • Types • User Input • Converting Input Types • Arithmetic Expressions • String Operators • Comments • Functions • Basic Collection Types • Indexing and Slicing

Example Assignments / Labs	• Printing
	  ○ Print messages to the console
	• Variables
	  ○ Create variables of different types, and print them to the console.
	• Types
	  ○ Investigate the types of different variables
	  ○ Convert between types
	• Arithmetic Expressions & Converting Input Types
	  ○ Age in One Year - Ask the user how old they are, and tell them how

	old they will be in one year ○ Rectangle, part 1 - Make variables for length and width and compute area and perimeter ○ Rectangle, part 2 - Ask the user for length and width and compute area and perimeter

Module 6: The Data Science Life Cycle (2 weeks/8-10 hours)

Students will learn and apply the process of the data science life cycle. This includes asking statistical questions, collecting or obtaining reliable data, analyzing the data, and summarizing the results.

Objectives / Topics Covered	● Spreadsheet Basics ● Data Cleaning ● Sorting and Filtering Data ● Data Visualizations ● Pivot Tables ● Mean, Median, Mode
Example Assignments	● Basic Operations Exploration ○ Explore rows and columns, ranges, formulas, comparison operators, text and number data types, currency and dates, and logic values. ● Data Cleaning ○ Address issues in data such as missing values, irrelevant data, formatting issues, and duplicate data. ● Influential Women ○ Practice sorting data and creating filters while learning about influential women. ● Which Visualization is Best? ○ Explore the variety of visualizations that exist in Google Sheets. ○ Compare different visualizations for the same dataset to determine which visualizations work best for specific data. ● Sneaker Boutique Sales ○ Help identify items that generate the most revenue for a company by creating pivot tables ● Unemployment Rates ○ Discover the average unemployment rate in the U.S.

Module 7: Final Project (1 week/5 hours)

Students will apply Python programming and data analysis to explore real-world issues related to emerging technologies. They will simulate decision-making systems, clean and analyze data, and present technical and ethical insights through a final presentation or report.

Objectives / Topics Covered	● Group Collaboration and Research ● Simulation Design Using Python ● Conditionals, Loops, Lists, and Functions ● Data Cleaning in Google Sheets ● Statistical Analysis and Visualization ● Ethical and Societal Implications of Technology ● Technical Presentation and Reflection

Example Assignments	• **Project Introduction**
	  ○ Explore how emerging technologies impact daily life and brainstorm problems that could be modeled with code and data.
	• **Groups and Data Brainstorm**
	  ○ Collaborate to choose a technology (e.g., facial recognition, AI in hiring, autonomous vehicles).
	  ○ Research credible sources and identify or plan a dataset for analysis.
	  ○ Draft a problem statement and group summary.
	• **Create a Program**
	  ○ Design and build a Python simulation that reflects a real-world process.
	  ○ Use input(), conditionals, loops, lists, and user-defined functions.
	• **Testing and Debugging**
	  ○ Test program thoroughly, fix errors, and reflect on functionality and limitations.
	  ○ Respond to prompts about the purpose, design, and realism of the simulation.
	• **Data Deep Dive**
	  ○ Clean and process a dataset in Google Sheets using formulas like `=COUNTIF`, `=AVERAGE`, sort/filter tools, etc.
	  ○ Create at least one meaningful visualization (bar chart, line graph, pie chart, etc.).
	  ○ Write a brief reflection on data patterns or findings.

Supplemental Modules

Choose to challenge or support your students by including one of the supplemental modules listed below.

Module	**Overview**
Karel in Python (3 weeks/15 hours) *If added, recommended before Module 5: Python Fundamentals*	In this unit, students learn the fundamentals of Python programming with Karel the Dog by exploring key concepts such as commands, functions, control flow, loops, conditionals, and top-down design. Through hands-on activities like building pyramids, delivering pancakes, and navigating random hurdles, students develop problem-solving skills by breaking down complex tasks into manageable functions and using control structures to guide Karel's behavior.
Data Science in Python (4 weeks/20 hours) *Can replace Module 6: Data Science with Sheets*	Students will learn and apply the process of the data science life cycle. This includes asking statistical questions, collecting or obtaining reliable raw data, analyzing the data using measures of central tendency and spread and interpreting, and summarizing the results.