

Orange Unified School District
Fundamentals of Programming
Year Course

Grade Level: 9-12

Prerequisites: None

Introduction to the Subject:

Fundamentals of Programming is a comprehensive, self-contained, fully-computer integrated one-year course, which gives an overview of the software development process by creating 2D and 3D PC game projects. Students will learn programming skills such as web development with HTML, database creation with MS Access, and object-oriented programming with logical data structures, sequences, Boolean logic, user interfaces, event-driven programming, loops, lists, dictionaries, functions, and graphics. The class will provide a solid foundation of programming skills, which will carry over into future computer science courses.

This course supports the California Business Education Career Path and Model Curriculum Standards for the Information Technology Industry sector, Programming and Systems Development Pathway.

Course Objectives:

By the end of the course:

- Students will learn to express themselves creatively with new technologies.
- Students will obtain intermediate to advanced computer literacy skills to be able to understand the importance of effective interfaces in the interaction between humans and computer system.
- Students will explore computational ideas through person and meaningful projects.
- Students will maintain a digital portfolio that highlights completed projects.
- Students will communicate both verbally and in writing in a professional manner with peers, faculty, and members of the community.
- Students will understand the creation and design of a software program, as well as the software development cycle.
- Students will have a basic understanding of the core concepts and techniques of computer science (software development cycle, determining hardware requirements, operating systems, networking, algorithms, logic flows), software applications, and programming languages using Microsoft Access, DarkBasic, GameMaker, Alice, html, JavaScript, and the iSupport Learning Virtual Internship program, that can be applied to more mainstream projects.
- Students will use critical thinking skills such as asking questions, analyzing problems, and supporting arguments and conclusions.
- Students will use peer reviews to analyze peer work and provide problem solving feedback.
- Students will develop a knowledge and understanding of the concepts of game development (storyboarding, designing, programming, testing, debugging) to create projects from conception to completion.
- Students will demonstrate an understanding of creating a video game suited to the needs of a business model or venture that fits the budget and timeline criteria of the customer, meets the short- and long-term goals of the customer, and meets the project specifications.

- Students will understand intellectual property, privacy and non-disclosure agreements.
- Students will obtain career knowledge and goals in the computer science and video game development industries.
- Students will obtain employability skills such as time management, problem solving, critical thinking, and cooperative planning while working on projects.
- Students will develop an organizational system to maintain information including specifications, pertinent research, and design choices.
- Students will develop innovative solutions to non-familiar problems by demonstrating various types of reasoning as appropriate for the needs of the situation.
- Students will develop and practice metacognition skills by analyzing what they already know about the topic, what they need to know about the topic, how they learn best, how to get information they need, whether they fully understood what they heard, read, or learned, and whether they know when they made a mistake and why they made it.

Recommended text(s):

- Shelly, Gary B.; Cashman, Thomas J., Herbert, Charles W., *Alice 2.0, Introductory Concepts and Techniques*, Thompson Course Technology, 2007.
- Habgood, Jacob and Overmars, Mark, *The Game Maker's Apprentice, Game Development for Beginners*, APress 2006.

Supplemental Text/Materials:

- Web Video Game Virtual Internship simulation, I Support Learning, Inc., PO Box 398, Olathe, Kansas 66051, 877-828-1216, 866-596-5109 fax, Email – Steve Waddell at swaddell@isupportlearning.com
- Shelly, Gary B.; Cashman, Thomas J., Pratt; Philip J.; Last, Mary Z., Microsoft Access 2002, *Introductory Concepts and Techniques*, Thompson Course Technology, 2002.
- Habgood, Jacob and Overmars, Mark, *The Game Maker's Apprentice, Game Development for Beginners*, APress 2006.
- Documentaries from The Discovery Channel and The History Channel.
- Episodes/excerpts from Pokémon, Dragonball Z, Yu-Gi-Oh animated TV shows and movies

Course Overview and Approximate Time Allotments

First Semester

Weeks

- | | |
|---|---|
| I. Careers in Computer Science | 2 |
| A. Students research job openings, salaries, education requirements needed to obtain these careers, and the higher-education programs that can provide degrees in each field. | |
| II. Introduction to databases using Access | 4 |
| A. Students learn the proper procedures for creating databases and are introduced to new input technologies. | |
| B. Students learn what databases are, the components of a database, and how to create tables, add and modify records to the tables, assigning keys, creating forms, creating reports, creating queries, using AND/OR operators, sorting data, omitting duplicate, sort by multiple keys, join tables, use calculated fields in a query, calculate statistics, filtering records, changing structures, creating validation rules, specify a collection of legal and default values, updating validation rules, specify referential integrity, using sub-datasheets, creating single and multi-field indices. | |

- III. Programming animations and video games in Alice. 6
- A. Exploring Alice and Object-oriented programming
 - 1. Students are introduced to the concept of object-oriented programming.
 - 2. They learn how to start Alice, and become familiar with the Alice drag-and-drop interface and its components.
 - 3. This project also has students load and play an existing Alice world, create and save a new Alice world, and print the code for Alice methods and events.
 - B. Developing Software methods
 - 1. Students learn top-down design and modular development within the context of a program development cycle.
 - 2. The project explores the process and benefits of developing software as a collection of smaller modules that can be tested individually, then put together to form the overall program. They are guided through a step-by-step project in which they design, code, test, and debug an Alice world with several software methods.
 - C. Programming with logical structures –
 - 1. Students learn about the three major elements of logical structure found in algorithms: linear sequences, selection sequences, and repetition sequences, and how to implement these in Alice using built-in functions and methods.
 - 2. Students learn to use Boolean AND, OR and NOT operations along with the six logical comparison operations used in computer programming to create simple and compound Boolean expressions in Alice looping or branching instructions.
 - D. Creating event-driven software
 - 1. Students learn how to create interactive software using modern techniques of event-driven programming.
 - 2. Students learn how event listeners detect event triggers and call event handlers into action.
 - 3. Students also create their own events with Alice's easy-to-use event editor.
- IV. Programming video games in Dark Basic using the iSupport Learning Web Video Game Virtual Internship simulation. 5

Second Semester

Weeks

- V. Create a video game in GameMaker. 6
- VI. Creating web pages. 6
- A. Students learn to create a website using a free text editor and Flash to program CSS style sheets, html, xml messages, and javaScript forms with textboxes, radio buttons, check boxes, and submit and clear buttons.
 - B. Students learn how to create frames that include marquees, a navigation bar, pictures, email links, a form, tables, borders, and internal and external hyperlinks.
 - C. They learn how to publish their website test, debug, and retest, as well as researching web hosts and domains, setting up an ftp server to transfer file, test, debug. Note: students do not publish their website projects to the Internet.

- VII. Students will use these skills to create their e-portfolio website. 3
- A. Students use Microsoft MovieMaker to create and render a movie highlighting their top five projects of the year.
 - B. Students use html, xml, xhtml, and javascript to create a website that will contain descriptions of what the student learned this year and include the end of year movie.
- VIII. Careers in Computer Science and Game Development industries 2
- A. Students create their résumé and cover letter
 - B. Learn proper emailing techniques
 - C. Follow-up with a thank-you letter and email
 - D. Practice interviewing techniques.

DATE OF LAST CONTENT REVISION: June 2007

DATE OF CURRENT CONTENT REVISION: August 2011

DATE OF BOARD APPROVAL: June 2007

Addendum

CALIFORNIA BUSINESS EDUCATION CAREER PATH AND MODEL CURRICULUM STANDARDS FOR THE INFORMATION TECHNOLOGY INDUSTRY SECTOR AND PROGRAMMING AND SYSTEMS PATHWAY

INFORMATION TECHNOLOGY SECTOR

1.0 Academics

Students understand the academic content required for entry into postsecondary education and employment in the Information Technology sector.

2.0 Communications

Students understand the principles of effective oral, written, and multimedia communication in a variety of formats and contexts.

3.0 Career Planning and Management

Students understand how to make effective decisions, use career information, and manage personal career plans.

4.0 Technology

Students know how to use contemporary and emerging technological resources in diverse and changing personal, community, and workplace environments.

5.0 Problem Solving and Critical Thinking

Students understand how to create alternative solutions by using critical and creative thinking skills, such as logical reasoning, analytical thinking, and problem-solving techniques.

6.0 Health and Safety

Students understand health and safety policies, procedures, regulations, and practices, including the use of equipment and handling of hazardous materials.

7.0 Responsibility and Flexibility

Students know the behaviors associated with the demonstration of responsibility and flexibility in personal, workplace, and community settings.

8.0 Ethics and Legal Responsibilities

Students understand professional, ethical, and legal behavior consistent with applicable laws, regulations, and organizational norms.

9.0 Leadership and Teamwork

Students understand effective leadership styles, key concepts of group dynamics, team and individual decision-making, the benefits of workforce diversity, and conflict resolution.

10.0 Technical Knowledge and Skills

Students understand the essential knowledge and skills common to all pathways in the Information Technology sector.

11.0 Demonstration and Application

Students demonstrate and apply the concepts contained in the foundation and pathway standards.

PROGRAMMING AND SYSTEMS DEVELOPMENT PATHWAY

D1.0 Students understand the strategies necessary to define and analyze systems and software requirements.

D2.0 Students understand programming languages.

D3.0 Students understand the creation and design of a software program.

D4.0 Students understand the process of testing, debugging, and maintaining programs to meet specifications.

D5.0 Students understand the importance of quality assurance tasks in producing effective and efficient products.

D6.0 Students understand the importance of effective interfaces in the interaction between humans and computer systems.