

Secondary Course Description

COVER PAGE	
1. Course Title: Introduction to Coding and Computer Science	9. Subject Area: History/Social Science English Mathematics Science Language other than English Visual & Performing Arts DJUSD Graduation Elective College Prep Elective (will seek UC/CSU approval)
2. Transcript Title / Abbreviation: Intro Coding/CompSci	
3. Transcript Course Code / Number (Office Use Only):	
4. School: Da Vinci Charter Academy	
5. District: Davis Joint Unified School District	
6. Length of Course: 1 Year	10. Grade Level(s): 9-12
7. School / District Web Site: http://www.djUSD.k12.ca.us/	11. Seeking "Honors" Distinction? Yes No
8. School Contact: Da Vinci Charter Academy Name: Tyler Millsap Title/Position: Principal Phone: (530) 757-7154 Ext.: Fax: E-mail: tmillsap@djUSD.net	12. Credit Value: 0.5 (half year or semester equivalent) 1.0 (one year equivalent) 2.0 (two year equivalent) Other: _____
13. Was this course previously approved by UC? Yes No If so, in what year? _____ Under what course title? _____	
14. Pre-Requisites: Completion of Integrated Math I with a C or higher or teacher recommendation Co-Requisites: N/A	
15. Preliminary Approval - Secondary Site Principal Signature (Must be signed before proceeding to Step 16) <i>Tyler Millsap</i>	
16. Date Course Proposal with Preliminary Approval (Step 15) sent to Associate Superintendent, Educational Services: _____	
17. Review & Approval: Date _____ Signature _____ ____ 10/18/16 Site Curriculum and Instruction Leadership Team Signature/Title: Math Department Chair <i>TM</i> ____ Secondary Department Articulation/Collaboration Signature/Title _____ Secondary Principal Signatures: _____ Date: _____	

BACKGROUND INFORMATION

Brief Course Description:

In this introductory course, students will gain a broad understanding of how to design, code, and test computer algorithms that solve problems. After learning basic computer science concepts such as variables, functions, iteration, branching, data structures and functions, students will apply these concepts to solve interdisciplinary problem sets in a variety of fields. The project based course will be hands on and include significant computer lab time for practice. By the end of the course students will design and code their own algorithms that solve problems in interdisciplinary fields such as science, economics, mathematics, and business. The second half of the course will focus on practical topics in computer science: (1) Data Science, and (2) Web Development. In the Data Science unit, students will learn how to analyze and process a large data set, then present the results in graphs and charts, using modern data visualization techniques. In the Web Development unit, students will learn the basics of full stack web development (connecting a website to a database) techniques used in e-commerce, social media, and interactive news content websites.

Context for Course:

List the State/District Standards addressed in this course.

The Computer Science Content Standards are currently under development (<http://www.cde.ca.gov/be/st/ss/computerscicontentstds.asp>). While the standards are not yet determined, this course covers material typically found in collegiate introductory computer science courses for non-majors. The first half of the course provides a broad introduction into computer science concepts such as variables, binary, iteration, branching, collections and functions. The second half of the course allows students to apply computer science skills in areas of Data Science and Web Development.

History of Course Development:

Why this Course is Relevant: Today, computing power is so ubiquitous, that all academic fields and businesses use computation methods to analyze data, solve problems, and predict future behavior. So important are these skills that “coding” is broadening well beyond computer science. Today, having coding skills will make you a better scientist, economists, analyst, manager, problem solver -- whatever you want to be. No longer a niche field, Computational Thinking (the ability to frame a problem so that it can be solved by computer resources) impacts all industries from healthcare to manufacturing to finance to art. A recent article summarizes this phenomena “Half of high-paying jobs in America now require this skill”. People use software on their computers and phones everyday, if not every hour; yet, to most, coding is mystery. This course aims to remove this mystery and make computer programming a practical step in solving problems.

As articulated in the below articles, the goal of getting computer science courses in K12 education is both a national and state priority. This course will help DJUSD move in this direction.

<https://edsource.org/2016/gov-brown-signs-law-to-plan-expansion-of-computer-science-education/569895>

<http://newsone.com/3545581/dems-seek-250000000-for-obama-computer-science-initiative/>

COURSE GOALS AND/OR MAJOR STUDENT OUTCOMES

Description of how this course supports district goal to increase student awareness and appreciation of diversity:

Coding skills are increasingly seen a gateway to better jobs in the 21st century. Yet, many socio-economic groups are being left behind. Currently, only 18% of computer science graduates are women. Similarly, other socio-economic groups are severely underrepresented in the computer science field. While a college degree provides a good foundation for coding careers, it is not the only pathway. Code Schools, as vocational training, are rapidly growing.

One problem is few high schools offer computer science curriculums, so many students never consider the field. With this course, more students will learn about these skills and determine if Computer Science is something they want to pursue further either in college, at a code school, or through self-learning.

COURSE OBJECTIVES

Students will learn how to design, code, and test algorithms that solve problems in a variety of fields. Students will learn computational thinking, how to frame problems so they can be solved by computer resources. Students will learn a modern computer language, widely used in industry today. Students will become familiar with general computer science concepts and practices.

COURSE OUTLINE

Week	Topic	Details
Part I		Programming Fundamentals
1-3	Set up	Introduce key concepts; Install Python; IDLE; write our first program; command line; REPL, compiling, learn binary; Debugging; Reserved words
4	Variables / Data Types	Primitive data types (string, integers, floats, boolean); naming conventions for variables; input; initializing variables

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5-7	Iteration / Branching	Indentation; Iteration loops (for, do, while); branching (if-elif-else); Code blocks; Nesting code blocks; break; modulus;
8	Random	Random numbers
9-10	Files	File input and output; csv files
11-12	Strings	Substring; Iterating strings; String as a collection
13-14	Functions	Separation of Concerns; Functions, parameters; return values
15-17	Collections	Lists; Arrays; Sorting
18-20	Functions	Returning collections
Part II		Project Based Learning
A	Data Science	Learn to navigate large data sets; design algorithms that perform statistical analysis; analyze data; draw conclusion; create data visualizations (line, pie, graphs, scatter plots, etc)
B	Web Development	Introduction to HTML, post, get, flask, SQL

TEXTS AND SUPPLEMENTAL INSTRUCTIONAL MATERIALS

Title, Author, Publisher, Edition: How to Think Like a Computer Scientist, by Allen Downey, Jeffrey Elkner, and Chris Meyers

Previously Adopted? Yes No (If no, provide information directly below)

Cost per book \$0

Total Cost

Budget Source

Other: The online book is part of the Python Open Source Software. All of the software, platform, book is available at no cost.

<http://www.greenteapress.com/thinkpython/thinkCSpy.pdf>

It is important to note that the lack of expense for this course is due to the fact that Da Vinci possesses most of the infrastructure. Students already utilize school or personal laptops and wireless access is provided. The text for the course is opensource and free. There may be small costs associated with furnishing the room for the course but those are yet unknown. The primary cost will be the personnel for teaching the course. This will be a .2 teacher assignment and a number of hours on a VSA for a coding industry person to consult on curriculum design and instruction.

DIFFERENTIATED INSTRUCTIONAL METHODS AND/OR STRATEGIES

Strategies for Supporting School Goal of Improving Writing Skills:

In addition to writing algorithm (precise computer instructions) students will follow industry practices and fully document their code so that other programmers understand how the code works.

ASSESSMENT METHODS AND/OR TOOLS

Students will be assessed by projects, code reviews, peer reviews, tests, quizzes, and problem sets. If interested, students will be prepared to compete in local coding competitions. While not an AP course, students will learn the fundamentals, so that with some additional studying, can take the Computer Science AP Exam.

ASSESSMENT CRITERIA

The existing framework/standards for computer science will serve as the assessment criteria particularly for the first half of the course. Students will be expected to demonstrate proficiency on concepts through quizzes, tests, and activities that apply concepts. In the second semester of the course, assessment will shift towards application of concepts through real-world coding demonstrations. These will be performance-based and will be assessed using Da Vinci's Expected School-wide Learning Results.

HONORS COURSES ONLY

Indicate how this honors course is different from the standard course.

Cover Letter for Introduction to Coding & Computer Science Course Proposal

In light of a decline in elective course offerings at Da Vinci High School, staff has expressed interest in developing new electives for the 2017-18 year. This fact, in conjunction with the ongoing development of California Standards for Computer Science, and research indicating strong growth in coding employment opportunities has led to this proposal for a course titled Introduction to Coding & Computer Science.

Here are the key points in the development of this course proposal:

- An initial meeting was held in early August between Principal Tyler Millsap and coding professional, Terry Toy. Mr. Toy and Mr. Millsap discussed the possibilities for the course and developed a timeline for the course proposal process.
- During August and September, Mr. Toy developed the course outline in consultation with Principal Millsap. Mr. Toy consulted the current AP Computer Science Course, course descriptions from other high school programs, and coding industry training materials. A course outline was shared in early October.
- During October, Principal Millsap shared the course proposal with Da Vinci counseling staff and Da Vinci Math staff for feedback. This included head of the math department, Natalie Bladis.
- During October, Principal Millsap shared the course proposal and outline amongst Da Vinci staff using a "Critical Friends" tuning protocol. The results of that feedback are attached here.
- On November 15, a student focus group was held at Da Vinci. During this focus group, Mr. Toy presented an overview of the course and several sample lessons to a group of 23 students. This was followed by an oral feedback session and a digital survey. Mr. Toy's presentation and the feedback and survey results are attached here.
- On December 8, Principal Millsap met with Director of Curriculum, Instruction and Learning to finalize the course proposal for presentation to the Board of Education.

This proposed course is an initial step in a proposed pathway towards. In one sense, the course already builds upon a ninth grade Computer Science course, wherein students are exposed to the basics of coding through Python coding language. This new course will also utilize Python, creating some articulation from junior high to high school. Da Vinci intends to build upon the Introductory Coding and Computer Science course in the future through the creation of a secondary, more advanced, Coding Course offering. Additionally, Da Vinci is in the initial stages of identifying local businesses and organizations that would be willing to host student interns that have completed the course. This experience would serve as a capstone, providing practical application and professional experience in the industry. Finally, Da Vinci is exploring the possibility of aligning the content of the course with community college offerings allowing students to simultaneously earn college and high school credit.

It is clear that this course could benefit from CTE designation; however, at this time, there are not staff members with this certification. The plan is for the course to be co-taught by one of our current math teachers and by an employee working in the coding industry. The opportunity and encouragement for one or both of these teachers to earn CTE certification will be provided.

