Connecting VCCS Courses to a Project Based Dual-enrolled High School IT / CS Program

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NVCC Alexandria / Arlington Public Schools

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& Computer Science Peer Group Conference
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This presentation describes planning for the IT / CS program at a new school:

Arlington Tech

Arlington Tech is a "choice program" within Arlington Public Schools focusing on project based learning (PBL).

Arlington Career Center

- Built in 1970s for APS CTE programs
- Approx. 1100 students each day
- Mixture of CTE, academic and special needs programs
- Arlington Tech launched this year

Arlington Tech is a rigorous, project-based learning, high school program that prepares students to succeed in college and in the workplace through collaborative problem solving.

Arlington Tech

Arlington Career Center

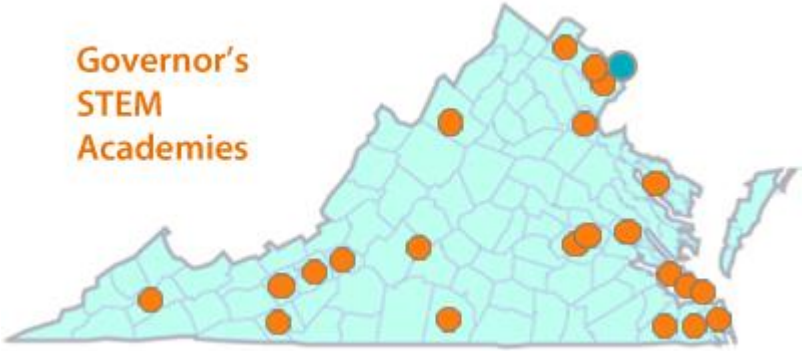
NOVA | Northern Virginia Community College

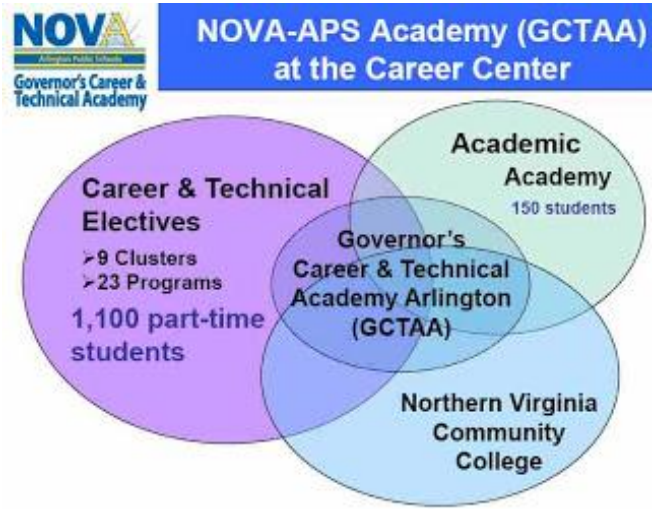
VIRGINIA DEPARTMENT OF EDUCATION

Institutional Stakeholders

Historical Roots: GCTAA

NOVA
Arlington Public Schools
Governor's Career & Technical Academy





Thinking Backwards: Goals

- Integrated project based learning (PBL)
- Career and Technical Education (CTE) pathway
- College connected through dual-enrollment
- Serving needs of diverse student community

IT or CS?

Information Technology

- Direct school to work pathway
- Low barrier to entry
- Industry certification
- Wide opportunities for integrative projects

Computer Science

- Solid pathway to 4 year college
- Attractive to high academic achievers
- Opportunities for high end projects

Why Not Both?

Combining web design and development with computer science opens endless possibilities for integrative web application projects.

INFORMATION SYSTEMS TECHNOLOGY
Web Design and Development
Code: 221-352-03
Catalog Year: 2016-2017
Career Studies Certificate
Offered through AL, ELI, MA, WO

One Year			
ITD	110	Web Design I	3
ITD	210	Web Page Design II	3
ITE	115	Introduction to Computer Applications and Concepts	3
ITE	130	Introduction to Internet Services	3
ITE	170	Multimedia Software	3
ITN	100	Introduction to Telecommunications	3
ITP	100	Software Design	3
ITP	225	Web Scripting Languages	4
Total credits for the Web Design and Development Career Studies Certificate=25			

COMPUTER SCIENCE
Code: 2460
Catalog Year: 2016-2017
Associate of Science Degree
Offered through AL, AN, LO, MA, WO

Two Years			
[1]CSC	200	Introduction to Computer Science	4
CSC	201	Computer Science I	4
CSC	202	Computer Science II	4
CSC	205	Computer Organization	3

In this program you will learn:

HTML5 + CSS3 + JavaScript

BASH
THE BOURNE-AGAIN SHELL

SQLite

SVG

python

Bottle

For more information contact:

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jeffrey.elkner@apsva.us

Arlington Career Center
816 S. Walter Reed Drive
Arlington, VA 22204
Phone: 703-228-5800

Arlington Career Center
Instill A Passion For Learning by Doing

Taking Web Development was a Gateway to a new universe of Career Opportunities. I went from making websites to building software with the government. Web development was a key step in a marathon of success.

Chris Hedrick, Web Developer and ACC Alumnus

Web Development Certificate Program

- Learn to create websites
- Learn how the web works
- Learn HTML5, CSS3, JavaScript
- Learn SQL, SVG, and Python
- Get internship experience
- Earn college credits
- Earn GPA quality points
- Earn Industry Certification
- Earn NVCC Career Certificate

Level 1

High School Course

Sign up for this 2 credit high school course at the Arlington Career center:

- **Advanced Topics in Information Technology (96648W)**

The class meets each day at the Career Center.

College Course Credits

Eligible students will earn college credit through NVCC for the following courses:

- **ITD 110 – Web Page Design I** (3 credits)
- **ITD 210 – Web Page Design II** (3 credits)
- **ITE 130 – Introduction to Internet Services** (3 credits)

Level 2

High School Course

Sign up for this 2 credit high school course at the Arlington Career center:

- **Advanced Topics in Computer Information Systems (96649W)**

The class meets each day at the Career Center.

College Course Credits

Eligible students can earn college credit through NVCC for the following courses:

- **ITP 100 – Software Design** (3 credits)
- **ITE 115 – Computer Applications and Concepts** (3 credits)
- **ITE 170 – Multimedia Software** (3 credits)
- **ITN 100 – Introduction to Telecommunications** (3 credits)
- **ITP 225 – Web Scripting Languages** (4 credits)

Learning by Doing

Depending on available time and student interest, students who sign up for web development at the Arlington Career Center will be able to integrate the web development skills learned in their classes with Career Center projects in

- Cyber Security
- Robotics
- Transportation Technology
- Solar Energy
- Horticulture
- Insect Biology

and other areas of study based on student interest.

The Arlington Career Center is committed to providing students with internship opportunities with industry partners. Students will have a chance to experience the real world of work first hand.

Arlington Tech, the new project-based learning program at the Career Center, offers students a full day opportunity to apply learning to real world projects in a variety of areas, including web development.

In this program you will learn:

Welcome to MIT App Inventor

BASH
THE BOURNE-AGAIN SHELL

python

Java
ORACLE

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Arlington Career Center
Instill A Passion For Learning by Doing

Learning programming at the Career Center gave me the critical context and experience I needed to get my start in IT, and laid the foundation for my career. I can't recommend the program highly enough to students who want to learn more about the field.

Henry Grover, Red Hat Programmer and ACC Alumnus

Computer Programming

- **Learn App Inventor, Python, and Java programming**
- **Program mobile devices**
- **Program for the Web**
- **Learn in a project based, hands-on environment**
- **Earn transferable college credits in computer science**
- **Earn GPA quality points**

Level 1

High School Course

Sign up for this 1 credit high school course at the Arlington Career center:

- **Computer Programming (96638W) ***

The course meets on alternate days for a block period.

College Course Credits

You will earn college credit through NVCC for the following courses:

- **CSC 200 - Intro to Computer Science** (4 credits)
- **CSC 130 - Scientific Programming** (3 credits)
- **CSC 185 - Programming Tools** (1 credit)

***Note:** Prior completion of or concurrent enrollment in Pre-calculus is a requirement for this course.*

Level 2

High School Course

Sign up for this 1 credit high school course at the Arlington Career center:

- **Advanced Programming (96643W) ***

The course meets on alternate days for a block period.

College Course Credits

You will earn college credit through NVCC for the following courses:

- **CSC 201 - Computer Science I** (4 credits)
- **CSC 202 - Computer Science II** (4 credits)

***Note:** Prior completion of or concurrent enrollment in Calculus is a requirement for this course.*

Learning by Doing

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Project Based Learning

Arlington Tech's PBL focus allows (indeed demands):

- Global consideration of learning goals across all courses
- Integration of learning concepts with applications (projects)
- Integration beyond IT/CS disciplines

Thinking Backwards Again

Which software stack will address the overlapping content requirements of all our IT / CS courses? (Additional personal requirement: must use *free software*!)

Brief Detour: Why Free Software?

- PBL requires freedom to explore and invent
- Free software comes with pre-approved licenses
- Free software projects permit open participation (authentic projects)
- Free software projects permit open collaboration

Back to the Stack

- GNU/Linux + tools and utilities
- HTML5 / CSS3 / JavaScript
- App Inventor
- Java
- Python, ***especially Python!***

Why Python?

- Great language for teaching (low floor, high ceiling)
- Executable pseudo-code
- Language of choice for scientists needing to program
- Well suited to "server-side scripting" (Flask and Django)
- Becoming language of choice at colleges and universities
- Open, engaging community

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CSC200

Features	The Beauty and Joy of Computing	Thriving in Our Digital World	Mobile CSP	Code.org CSP	Project Lead the Way CSP
Course Delivery	Advanced, rigorous programming, mobile apps, internet API's	Project based learning and blended delivery using online materials	Project based learning harnessing app development	Daily lesson plans, App Lab widgets, Code Studio, discovery based instruction	Exposure to a wide range of professional tools and programming languages
Programming Environment	*Snap!* Python	Scratch Processing	App Inventor	Block OR JavaScript Internet Simulator App Lab	Scratch App Inventor Python PHP SQL HTML CSS JavaScript Linux & NetLogo
Course Development & Availability	8 units available, with continued development planned	Seven AP units available	Complete and available through website registration	Units 1 & 2 available; additional units to be rolled out in 2015-2016	Available to PLTW teachers and districts only
Support	Free online support through wiki and Piazza; crowd-funded 6-week PD to be available in 2016	PD for AP CSP with teacher stipend to be offered beginning Summer 2016	Free 6-week online PD for all teachers	15-month in-person/online PD with teacher stipend in partner districts (matching funds required)	Intensive 2-week in person training for teachers in PLTW districts (fee required for districts)
Websites	bjc.berkeley.edu	uteachcs.org	www.mobile-csp.org/	code.org/educate/csp	pltw.org/pltw-computer-science-curriculum

Mobile CS Principles

This course is supported by the Mobile Computer Science Principles Project (Mobile CSP), an NSF-funded effort to provide a broad and rigorous introduction to computer science based on App Inventor, a mobile programming language for Android devices. The course is based on the College Board's emerging Advanced Placement (AP) Computer Science Principles curriculum framework for introductory computer science.

CSC130

Beginning Python Programming

for Aspiring Web Developers

Using Python 3

by Jeffrey Elkner (with liberal borrowings from the work of Allen B. Downey and Peter Wentworth)

Last updated: 25 January 2017

CSC201

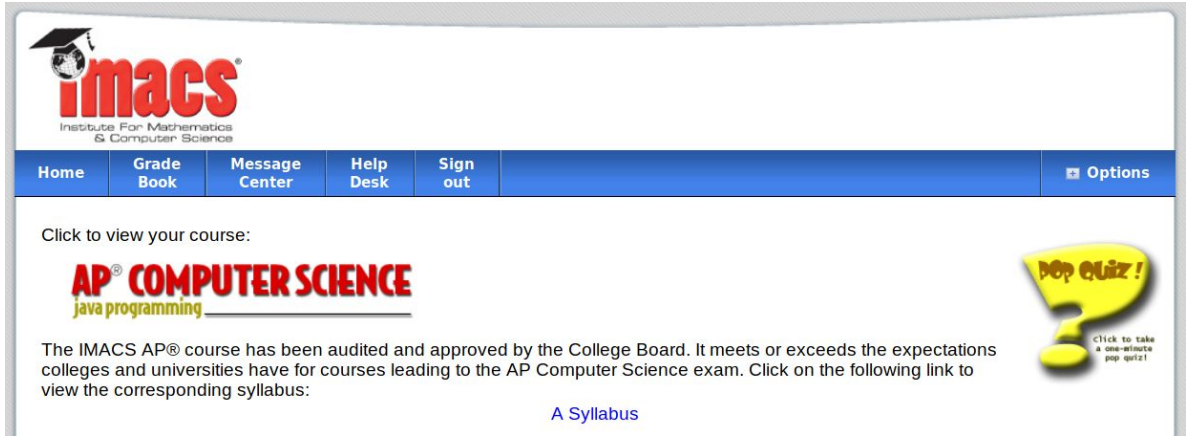
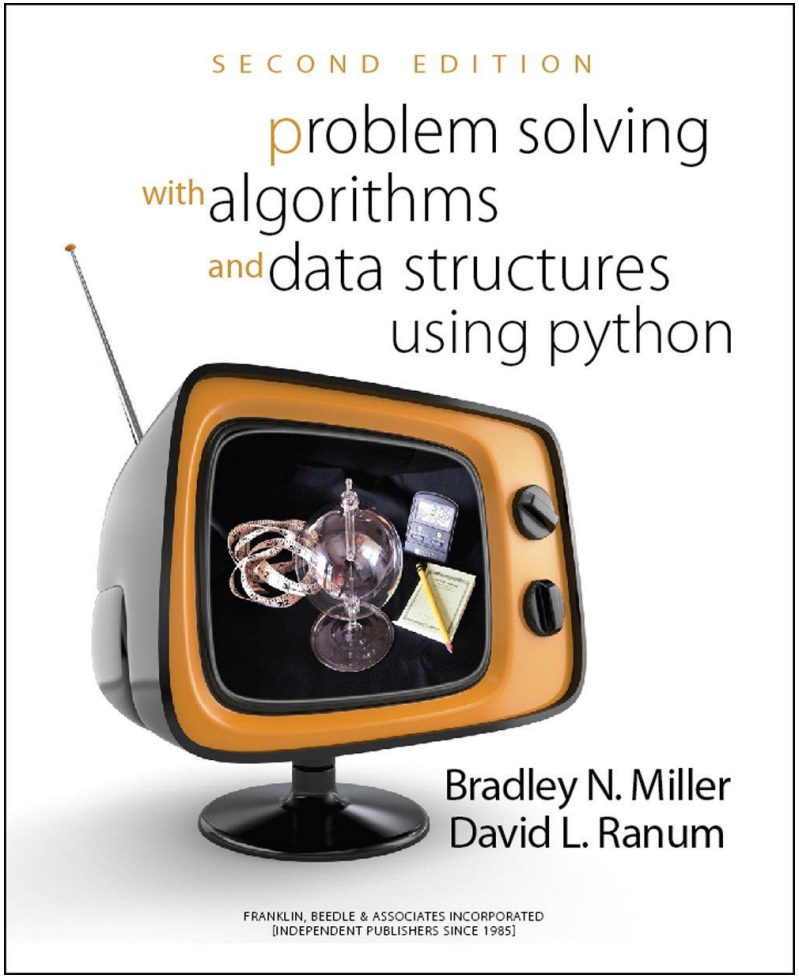


Table of Contents

CSC202



Problem Solving with Algorithms and Data Structures

Chapters

1. Introduction
2. Analysis
3. Basic Data Structures
4. Recursion
5. Sorting and Searching
6. Trees and Tree Algorithms
7. Graphs and Graph Algorithms

3. Basic Data Structur

Mark as completed

Where Is This Going?

In the next few years, I plan to:

- Connect with the OER community
- Reconnect with the Python community
- Develop integrated PBL IT / CS OER curriculum
- Reach out to and network with VCCS colleagues
- Develop partnerships for student career pathways
- Help change the world!

Contact Me!

Please email me at jeff@elkner.net or call me at 703-228-5771 if you would like to connect with me.