



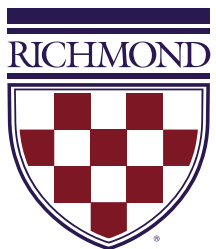
UNIVERSITY OF
RICHMOND

Welcome to CMSC 240!

CMSC 240 Software Systems Development

Today

- Introductions
- Course logistics
- Motivation
- Hello C++
- Environment setup
- In-class coding exercise





Introductions



Dr. David Balash



Professor Balash

“Ba-lish”

He/Him

- BS in computer engineering Iowa State
- Two-decade career as a software engineer
- MS and PhD in computer science from GW
- Research: Computer S&P

Faculty page: <https://cs.richmond.edu/faculty/dbalash>

Homepage: <https://davidbalash.github.io>

Dr. David Balash



Things I like

- 🎓 Education/Learning
- 🧑‍🌲 Hiking
- 🚲 Cycling
- 🎸 Guitars
- ♟️ Board games
- 💻 Programming
- 🐱 Cats

Ask me anything



Assignment 1

Task: Create a personal introduction slide and post it to the **introductions** channel on the course Slack workspace

Due: Friday

Points: 5

Be Creative

Name

Dr. David Balash



Photo



Professor Balash

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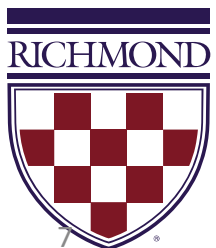
Faculty page: <https://cs.richmond.edu/faculty/dbalash>

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Pronunciation

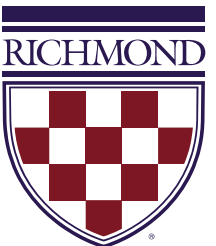
Pronouns

Personal Introduction



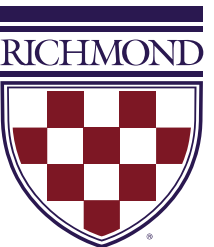
Classroom Meet and Greet

1. Introduce yourself to a person near you
 2. Introduce yourself to a different person near you
- Potential conversation topics:
 - What are some of the things that you like?
 - Who are your favorite pets?
 - Why do you want to take this class?



Student Introductions

- Name
- Pronouns (optional)
- Major
- Class year
- Favorite snack food

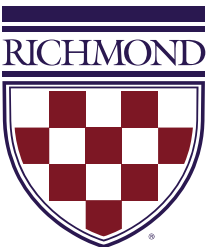


Course Logistics



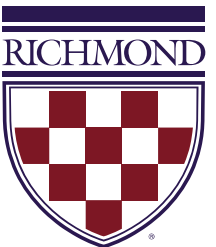
Classroom Norms

- Questions are always welcome!!
 - Ask them at any time
- “I don’t know” is okay
- Be curious
- Treat peers and instructors with kindness and respect
- Communication is key!
- Seek support when needed



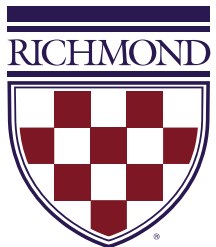
Where All Class Information Can Be Found

<https://cmssc240-f24.github.io>



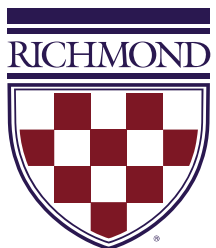
How to Communicate With Me

- Slack workspace
 - <https://cmssc240-f24.slack.com>
- After class or in office hours - 223 Jepson Hall
 - Tue 4:30PM - 6:00PM
 - Thr 4:30PM - 6:00PM
 - and by appointment
- Email
 - david.balash@richmond.edu



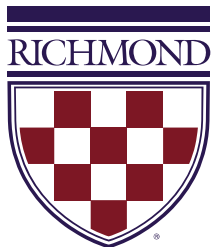
Course Outline

- **Weeks 1-5** Introduction to C++ programming
 - Syntax, memory management, libraries, file IO
- **Weeks 6-10** Object-oriented programming
 - Abstraction, polymorphism, inheritance, encapsulation
- **Weeks 11-15** Software systems development
 - UML, design patterns, testing, debugging



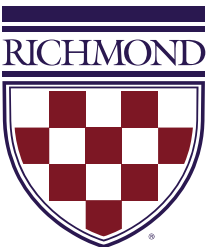
Learning Outcomes

- Experience modern C++ programming
- Gain familiarity with Unix/Linux environments
- Understand the software development life cycle
- Practice object-oriented programming and design
- Understand design patterns, reuse, and usability
- Exposure to version control systems
- Demonstrate skill in software testing and debugging



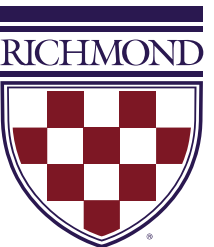
Lecture

- Tuesdays and Thursdays Jepson G04
- Will usually include in-class exercises
- In-class exercises will be due one week from when they are assigned (except during break)
- Regular attendance is expected
- Students who are sick should not attend class
- Notify me in advance of the absence, if possible



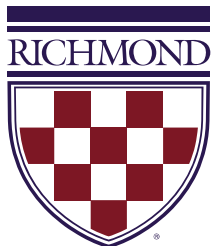
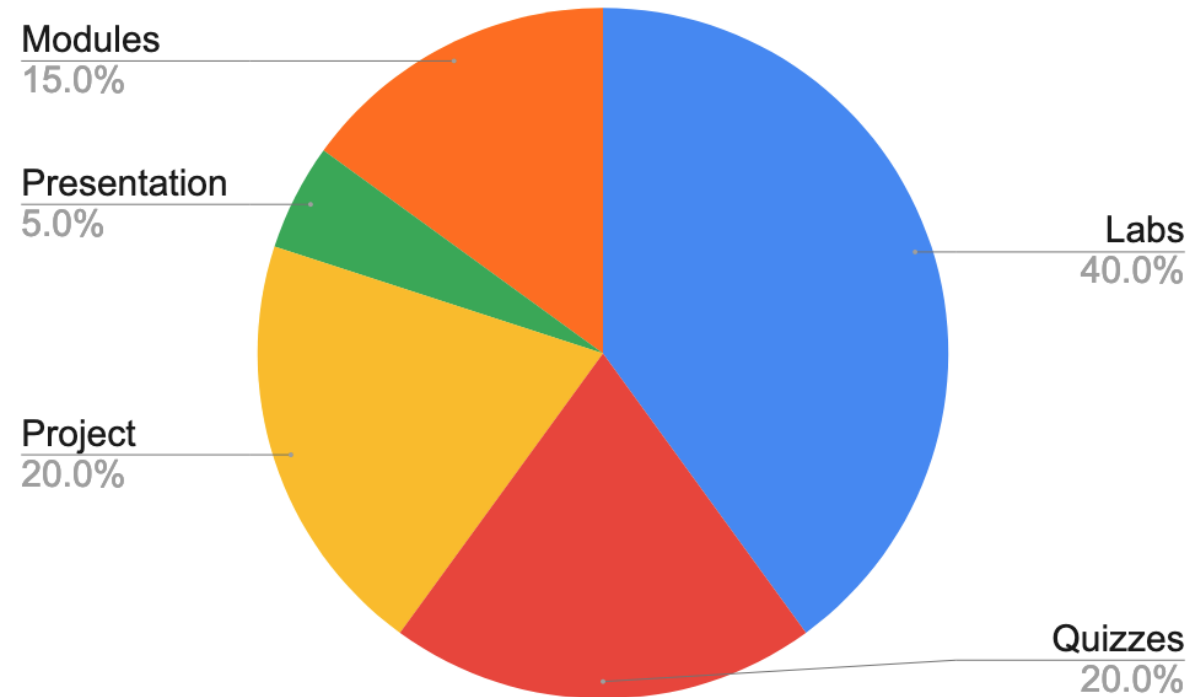
Labs

- Fridays in Jepson G04
- Lab assignments done individually and in groups
 - but will always be turned in individually
- Lab assignments are typically due at 11:59 pm on the night prior to the next lab (except during break)
- Please ask for help from me or the lab assistant



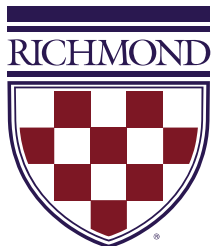
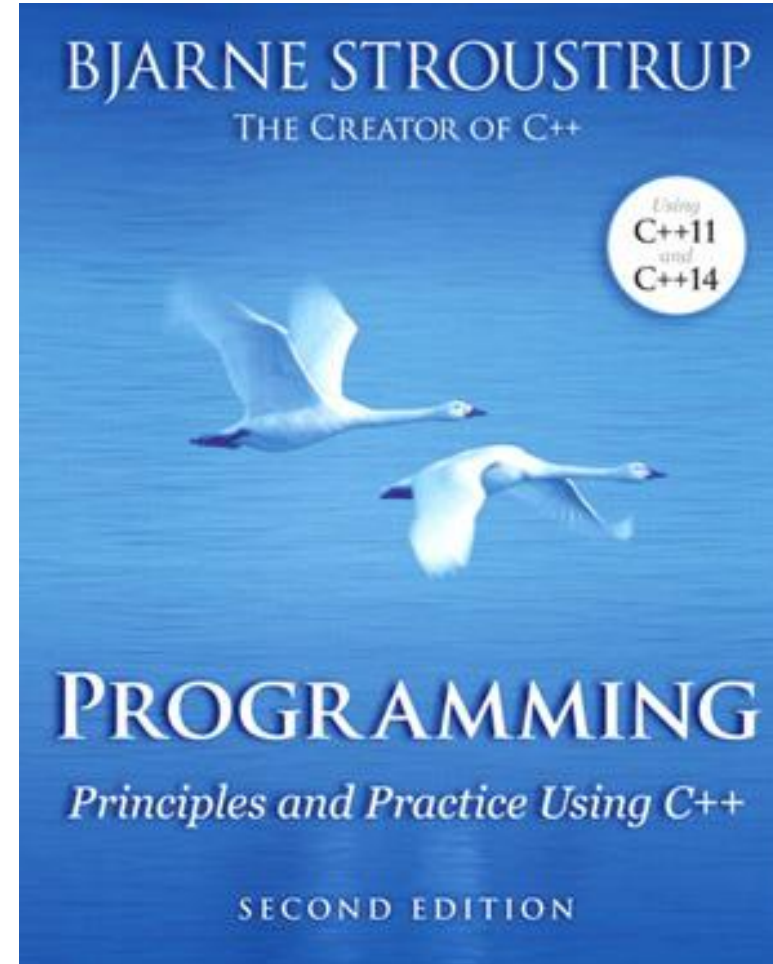
Coursework and Grading

- Modules (In-class coding exercises)
- Lab assignments
- Programming project
- Project Presentation
- 4 Quizzes (5% each)

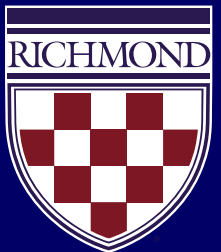


Textbook

- Free electronically from the UR library
- Reading assignments



Ask me a question



An aerial photograph of a university campus. The central focus is a tall, ornate brick tower with Gothic architectural features, including pointed arches and decorative stonework. The tower is surrounded by lush green trees and manicured lawns. In the foreground, several paved walkways with brick borders lead through the campus, where a few people can be seen walking. The sky is clear and blue. The word "Motivation" is overlaid in a large, white, serif font across the middle of the image.

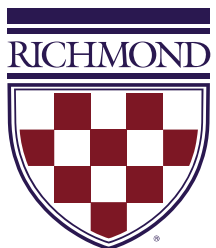
Motivation



C++ is a Very Popular Language

Aug 2023	Aug 2022	Change	Programming Language	Ratings	Change
1	1		 Python	13.33%	-2.30%
2	2		 C	11.41%	-3.35%
3	4	▲	 C++	10.63%	+0.49%
4	3	▼	 Java	10.33%	-2.14%
5	5		 C#	7.04%	+1.64%
6	8	▲	 JavaScript	3.29%	+0.89%
7	6	▼	 Visual Basic	2.63%	-2.26%

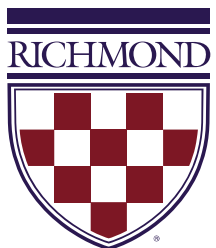
TIOBE Index for August 2023



Many Open-Source Projects

The screenshot shows the GitHub search interface with the search query "language:C++". The left sidebar shows filter options, with "Code" (76.5M) and "Repositories" (1M) highlighted in a red box. The main content area displays a list of search results for C++ projects, including:

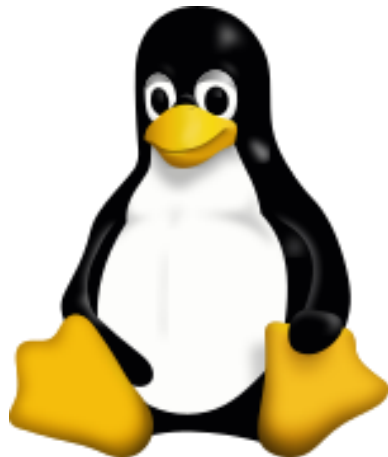
- totemstech/neuraln**: C++ · 274 stars · Updated on Jun 29, 2015
- wolfgangfengel/GPU-Pro-7**: Source code repository for the Book GPU Pro 7 · C++ · 273 stars · Updated on May 3, 2016
- YCAMInterlab/ofxTimeline**: lightweight timeline tools for openFrameworks · C++ · 265 stars · Updated on Aug 24, 2020
- TooTallNate/node-iOS**: Native node bindings to iOS functionality (vibrate, accelerometer, geoservices, etc.) · C++ · 264 stars · Updated on Aug 5, 2011
- shangjingbo1226/SegPhrase**: C++ · 258 stars · Updated on Oct 29, 2020



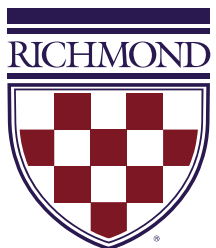
Cool Things Were Built With C++



amazon.com

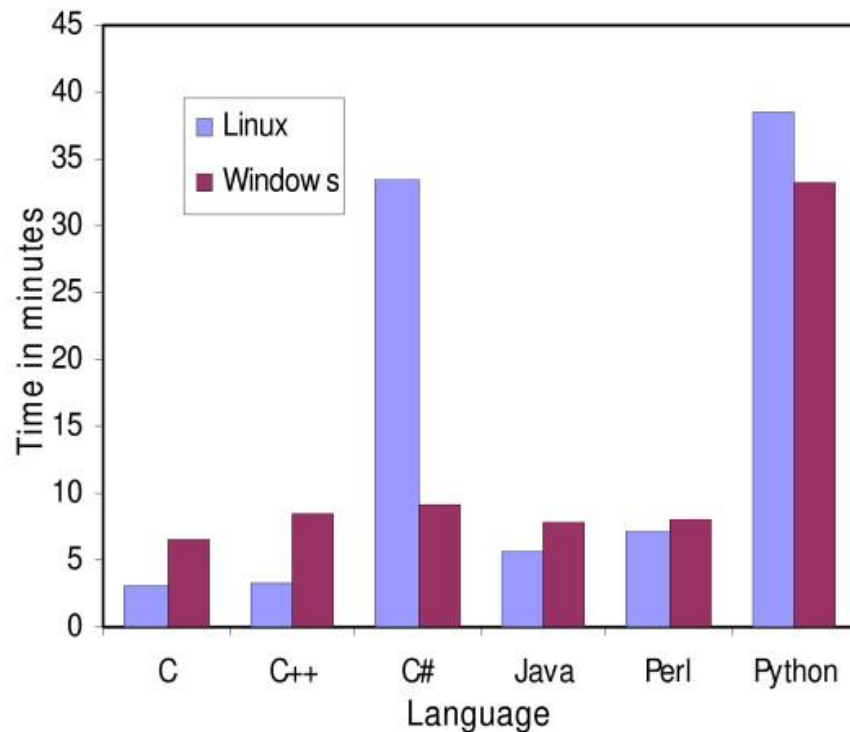


Google

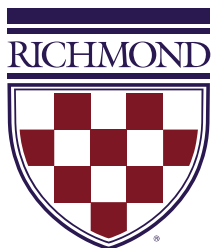
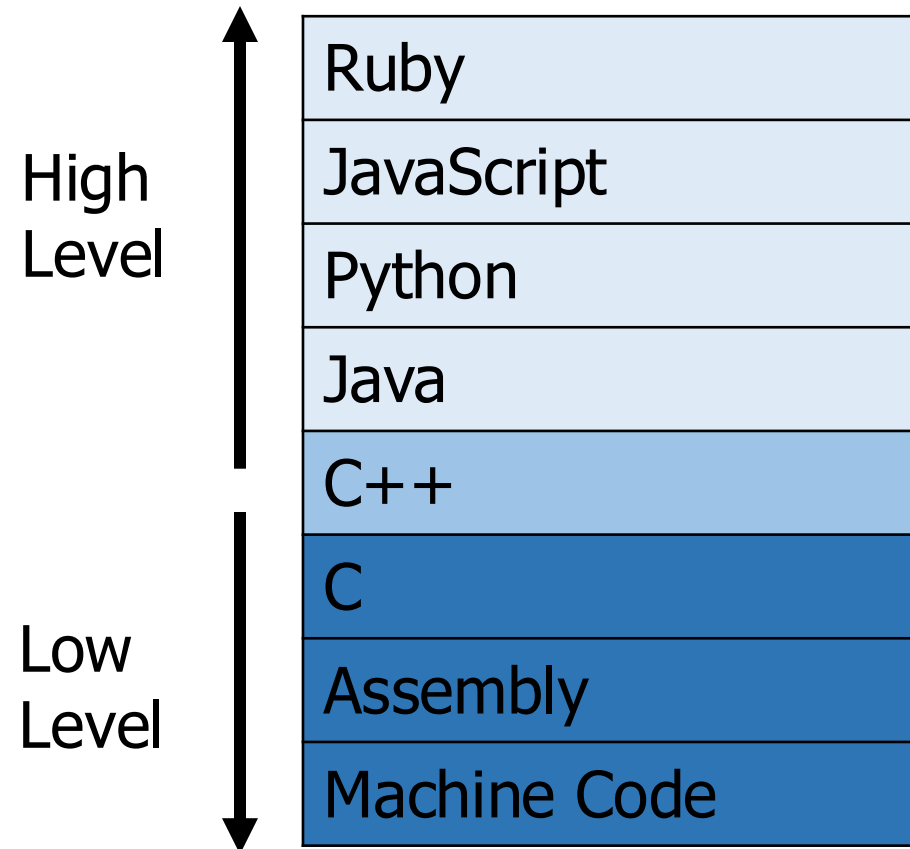


What Makes C++ Great?

Speed: It's Fast!

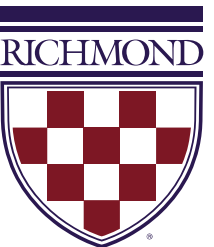


Low-level control



Foundational Software Development Skills

- Object-oriented design
- Software development life cycle
- Design patterns and code reuse
- Version control systems
- Testing and debugging



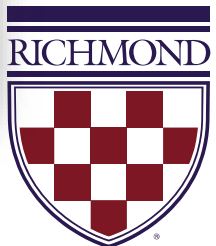
An aerial photograph of a university campus. The central focus is a tall, ornate brick tower with Gothic architectural features, including pointed arches and decorative stonework. The tower is surrounded by lush green trees and manicured lawns. In the foreground, several paved walkways with brick borders lead through the campus, with a few people walking. The sky is clear and blue. The text "Hello C++" is overlaid in the center of the image in a white, serif font.

Hello C++



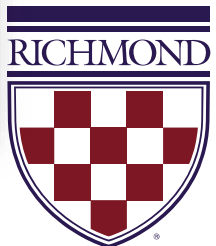
Writing Your First C++ Program

```
→ // This program outputs the message "Hello, World!"  
→ #include <iostream>  
→ using namespace std;  
  
→ int main()  
→ {  
→     cout << "Hello, World!" << endl;  
→     return 0;  
→ }
```



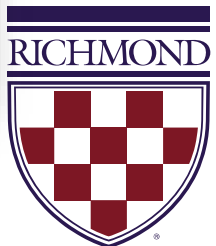
Writing Your First C++ Program

```
// This program outputs the message "Hello, World!"  
#include <iostream>  
// Without using namespace std  
  
int main()  
{  
    std::cout << "Hello, World!" << std::endl;  
    return 0;  
}
```




Writing Your First C++ Program

```
// This program outputs the message "Hello, World!"  
#include <cstdio>  
  
int main()  
{  
    printf("Hello, World!\n.");  
    // ^ a C function  
    return 0;  
}
```



Compile & Execute Your Program

```
g++ hello.cpp -o hello
```




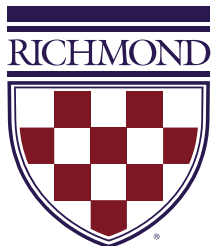
The C++
compiler

The source
code file name

Using the `-o` option
allows you to name
the executable file

```
./hello
```


indicates that the executable
resides in the current directory



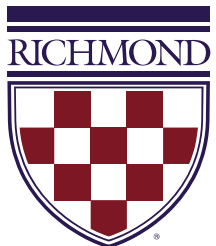


Environment Setup



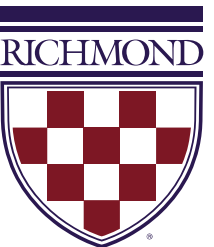
Development Environment

- All work will be compiled, run, tested and graded on the computer science Linux machines:
 - cs01 – cs06.richmond.edu
- GitHub classroom for all assignments
 1. Accept the assignment
 2. Clone repository using VSCode with remote-ssh
 3. Make updates to the code and README.md file
 4. Add (Stage), Commit, and Sync changes



Development Environment

1. Open a terminal
2. `ssh your_UR_netid@cs01.richmond.edu`
For example: my netid is **dbalash**@cs01.richmond.edu
3. Follow instructions:
 - <https://cmssc240-f24.github.io/guides/vscode-ssh>



In-Class Coding Exercise

