

CS100

Introduction to Programming

Lecture[0]

Course Introduction

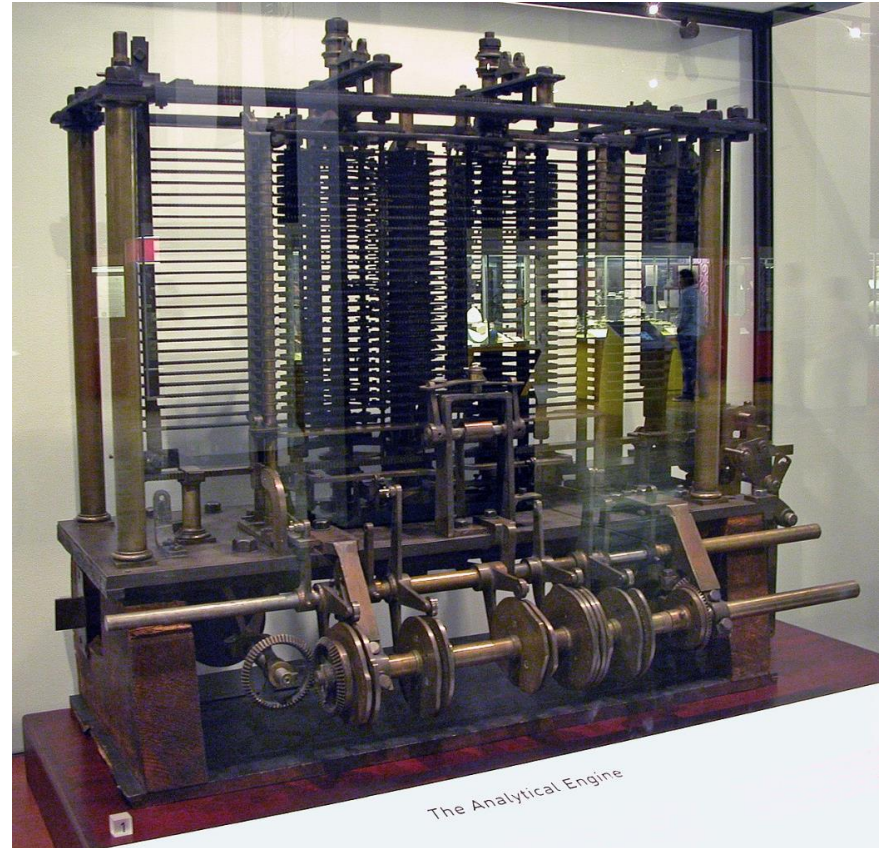
What is programming?

Computer **programming** is the process of writing instructions that get executed by computers. The instructions, also known as code, are written in a **programming language** which the computer can understand and use to perform a task or solve a problem.

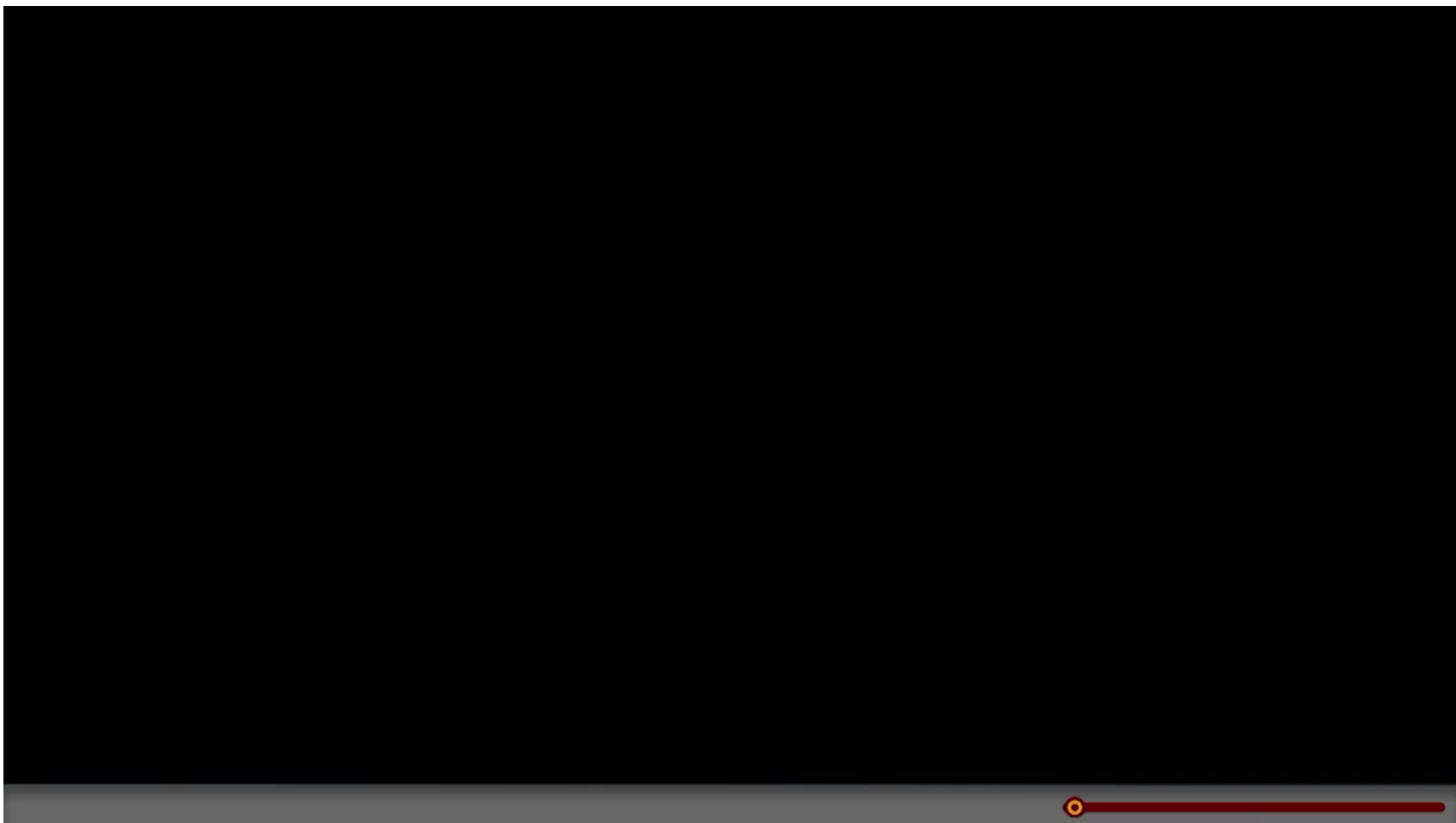
***Steve Jobs:** “Everybody in this country should learn to program a computer, because it teaches you how to **think**”*

A bit of history

- Analytical engine
 - Charles Babbage
 - Designed in 1837
 - Branching & Looping!
 - Turing-complete!



A bit of history



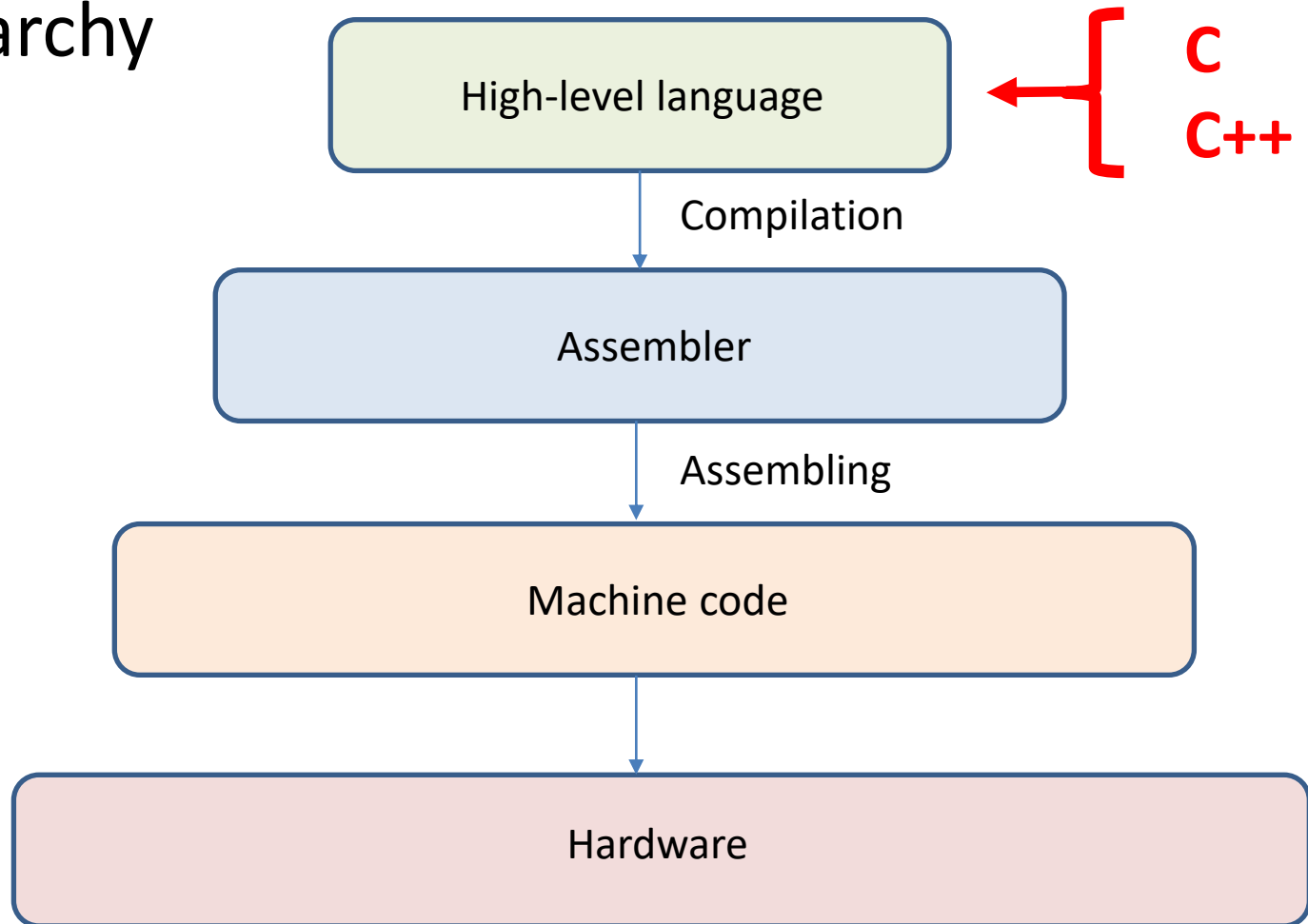
A bit of history

- In early devices such as “Analytical Engine”
 - Program is communicated via punched cards
 - Akin to modern day assembler language



Modern coding languages

- Hierarchy

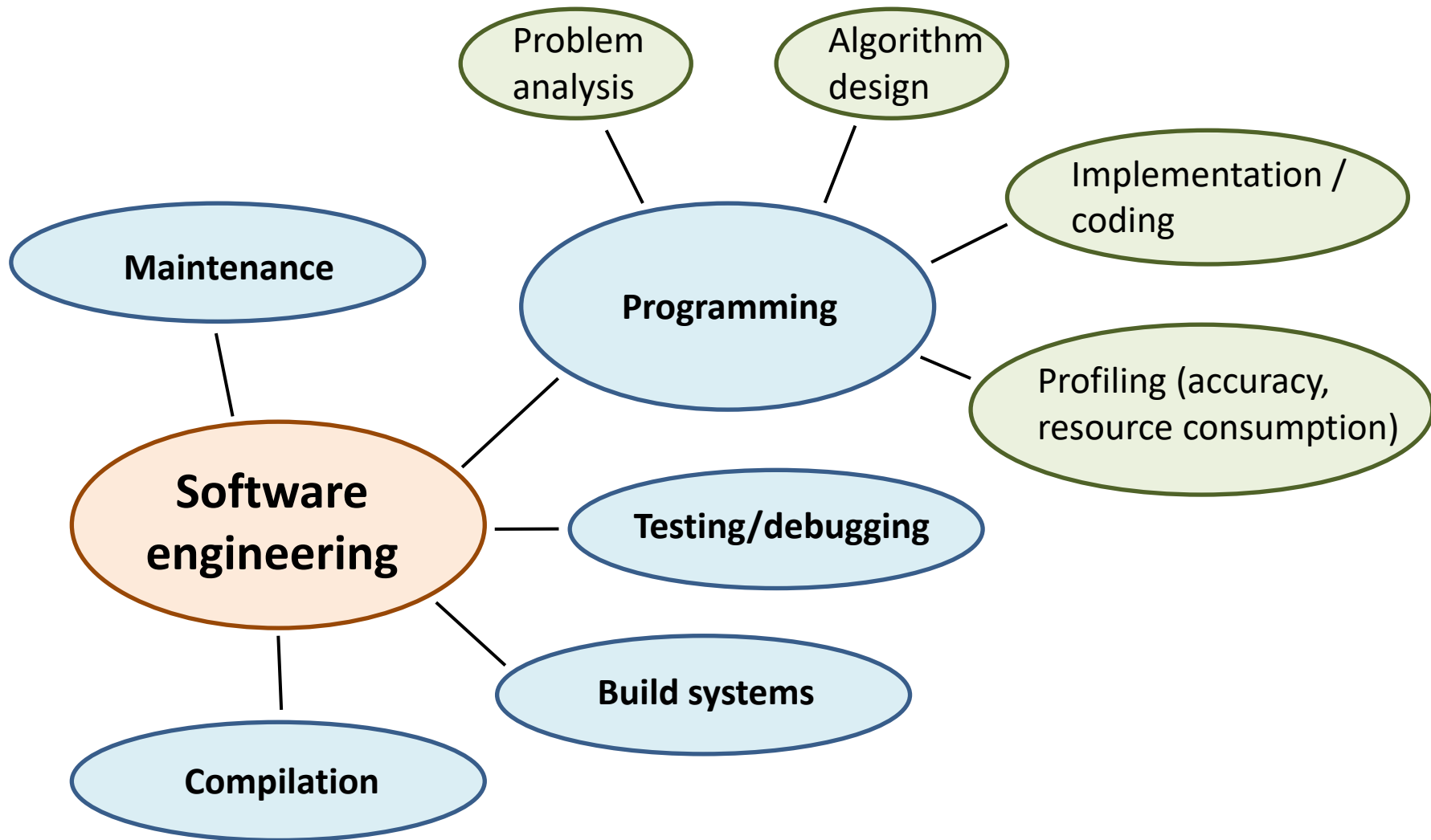


Modern coding languages

- Syntactically rich
- Better abstraction ability



What is programming?



Why Learning Programming in C?

- Why C?
 - Popular, early language
 - Permits implementation of sequential programs
 - “Standard” syntax
- Why C++?
 - Popular, higher-level language (Object-oriented)
 - Efficient programs
- Note:

C and **C++** are now considered **low-level languages** because they have no automatic memory management. The definition of **low level** has changed quite a bit since the inception of **computer** science.

Course Objectives

- Upon completion of the course, you should be able to:
 - Know how to analyze simple problems, and design programs
 - Know how to write them in C or C++
 - Know C/C++ syntax
 - Understand sequential vs. OO-programming
 - Get basics in functional programming
 - Have come in touch with multi-tasking and some useful C++ libraries

Lecturers



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Course Structure

- 15.5 weeks teaching (net)
 - 1 block C (~6 weeks, 12 lectures)
 - 1 block C++ (~10 weeks, 17 lectures)
 - 1 mid-term exam
- 2 lectures / week
 - Monday 8:15-9:55
 - Wednesday 8:15-9:55
 - Room: Teaching Centre 202
- 1 weekly recitation
 - 7 groups of about 40 students

Course Page & Material

- Main course page:
 - https://piazza.com/shanghaitech.edu.cn/spring2023/cs100_2023
 - Will contain
 - Lecture slides (including these slides)
 - Recitation material
 - Announcements
 - Homework
 - Q&A forum
 - **Please enroll by yourself if not already enrolled!**

Tentative curriculum

- Lecture 1: Intro/C program structure
- Lecture 2: Data types, operators and expressions
- Lecture 3: Simple input/output
- Lecture 4: Control flow
- Lecture 5: Functions
- Lecture 6: Pointers
- Lecture 7: Arrays
- Lecture 8: Character strings
- Lecture 9: Structures
- Lecture 10: Recursion

Tentative curriculum

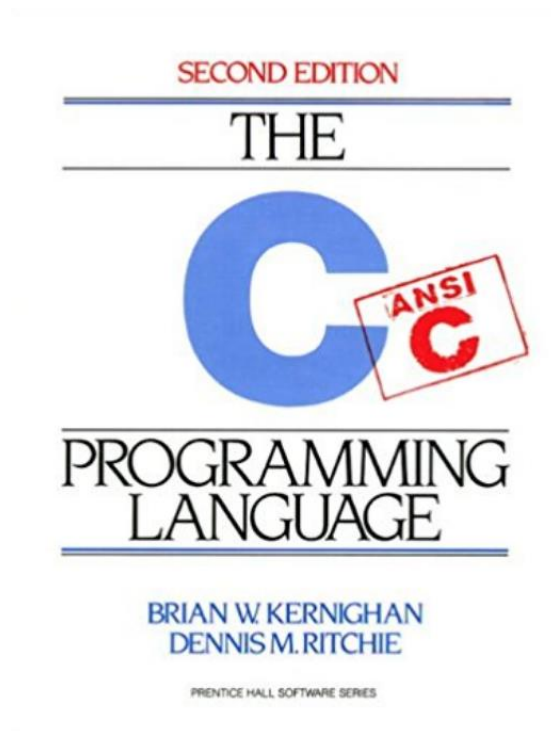
- Lecture 11: Algorithms and more advanced C
- Lecture 12: Revision of C
- Lecture 13: Object-Oriented Programming in C++
- Lecture 14: Inheritance
- Lecture 15: Polymorphism, STL templates
- Lecture 16: STL data structures
- Lecture 17: Memory management in C++
- Lecture 18: Structuring your code
- Lecture 19: Coding standards
- Lecture 20: CMake

Tentative curriculum

- Lecture 21: **Exam**
- Lecture 22: Concurrency
- Lecture 23: Profiling/Debugging
- Lecture 24: R-value references
- Lecture 25: Functional programming
- Lecture 26: New features in recent C++ standards
- Lecture 27: Eigen
- Lecture 28: Ceres
- Lecture 29: Interfacing with Python/Matlab
- Lecture 30: Review

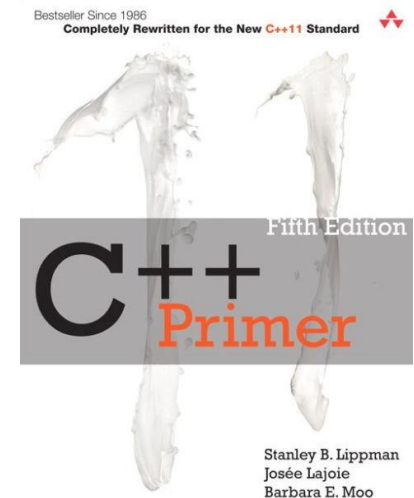
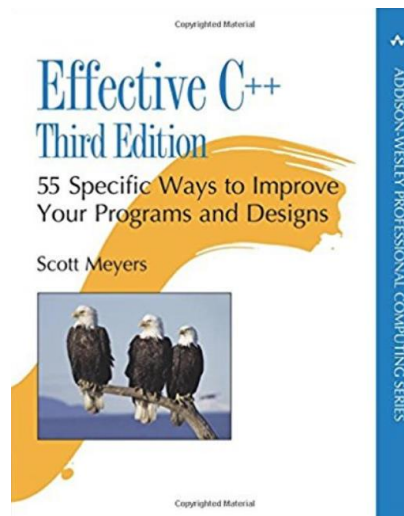
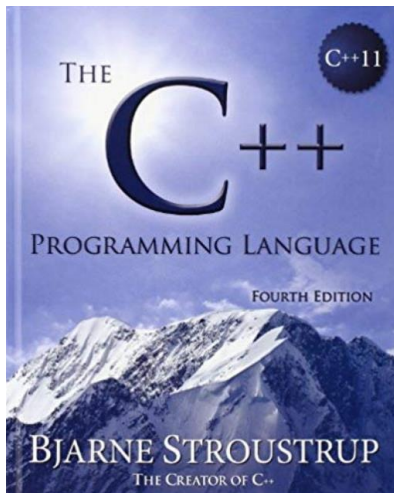
Recommended Literature

- C
 - *The C Programming Language* (2nd Edition), by Brian W. Kernighan and Dennis M. Ritchie, Prentice Hall, 2014 (available in the library)



Recommended Literature

- C++
 - *The C++ Programming Language*, 4th Edition, Bjarne Stroustrup, Pearson, 2013
 - *Effective C++*, 3rd Edition, Scott Meyers, Addison-Wesley, 2005
 - *C++ Primer*, Josée Lajoie and Stanley B. Lippman



Recommended Literature

- General note:
 - You are not required to buy those books
 - They are only suggestions in case you feel like buying a book, and some copies should be available in the library
 - Our material aims at being self-contained, and note furthermore that the internet is generally full of valuable resources

Some good addresses

- <https://en.cppreference.com/w/>
- <https://www.cplusplus.com/reference/>
- <https://stackoverflow.com/>

Recitations

- ~14 Units
- 2 Hr/week
- Individual groups of ~40 students, each having a fixed TAs throughout the semester
- Recitations are held on a weekly basis, and there will be 7 different groups @ different times
- Enrolment information will be posted on Piazza https://piazza.com/shanghaitech.edu.cn/spring2023/cs100_2023
- **Attendance mandatory!**

Recitations

- A mix of:
 - Revision of the course material
 - Provision of extra examples
 - Introduction of some new material & examples
 - Interactive examples:
 - Students are asked to solve some problems in class
 - Assistance/Answers provided by TAs during recitation
 - Introduction of homework
 - Clarification of general questions related to homework
 - Introduction of homework solutions
- Additional material (i.e. slides) will be posted on Piazza
- Recitations will be starting from 2nd week (2023/02/13)

Homeworks and assessment

Homework assignments

- 8 homeworks:
 - 4 shorter homeworks primarily on C at the beginning
 - 4 longer homeworks towards and after mid-term exam
 - Homeworks are at least bi-weekly
- Makes up for large part of your grade!
- Will be released during lectures
- Solution maybe reviewed during recitations
- Strict deadline (usually ~7-14 days later, 23:59 on the day)!
- Simple late submission policy:
 - 50% penalty if submitted before 23:59 on the day following the deadline
 - 100% penalty if no submission by 23:59 on the day following the deadline

Homework submissions

- Through Online Judge
 - Use of simple OJ, access will be provided in time
 - A git based OJ may be used later if required
 - Introduction to git in first recitation
- **We will check the code manually as well!**

Quizzes

- 2 quizzes
- During regular class, probing class attendance
- Time will not be announced in advance!
- Sickness policy:
 - Requires medical certificate
 - Requires attendance to make-up session (last chance!)

Attendance check of recitations

- We will also probe the attendance of the recitations by collecting signatures.
- We reserve the right to randomly probe recitations to verify that the number of attendees and the number of collected signatures is consistent!

Assessment

- A mix of
 - Regular homeworks: $4 \times 7\% + 4 \times 11\%$
 $= 28\% + 44\%$
 $= 72\%$
 - Mid-term exam: 22%
 - In-class quizzes: 4%
 - Recitation attendance checks: 2%
- **No final Exam!**

Communication

- Your primary point of contact
 - Your TA!
 - For all course material/recitation related matters
- Use the Piazza forum!
 - However, no code sharing of homeworks!
 - You may post general questions about language features and behavior or course content
 - We encourage you to first Google yourself, then use either forum or talk to TAs

Communication

- Teacher's contact
 - Prof Xu Lan:
 - Email: xulan1@shanghaitech.edu.cn
 - Office hours: Tuesday, 10am-12 noon, SIST 1C-303D
 - Prof Yuexin Ma:
 - Email: mayuexin@shanghaitech.edu.cn
 - Office hours: Friday, 1pm-3pm, SIST 1C-403E

Academic Integrity

- Unless explicitly noted, work turned in should reflect your own/independent capabilities
- No cheating
 - Do not share your homework repo/OJ PW under any circumstances! Always protect your homework!
 - No “fake solutions” (**we will check!**)
 - **No plagiarism** (copying of part/complete solution from somewhere else) (**we will check!**)
 - **Serious consequences, including the possibility of being expelled!**