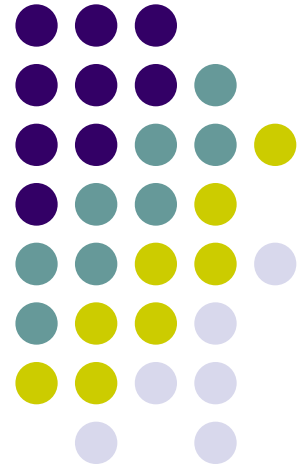


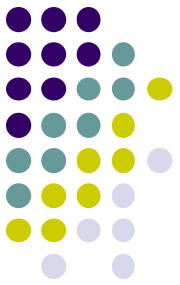
# Computer Organization & Architecture

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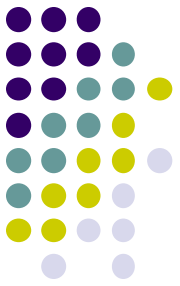
# Course Description

- A compulsory course for “Software Engineering” major and also one of the core courses of this major.
- Prerequisites: High-level Programming Language C++, Digital Logic
- The prerequisite of the following professional courses such as operating system.

# Course Objectives

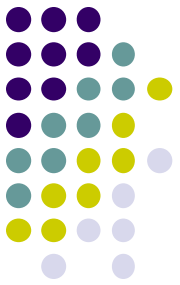


- Help students understand the structure, working principle, and internal operating mechanism of **the basic components of computers** (including ALU, controller, memory, and input/output)
- Deepen students' integrated understanding of computer software and hardware systems, establish a concept of hardware/software collaboration as a **complete machine**
- Enhance students' computer **system design** ability



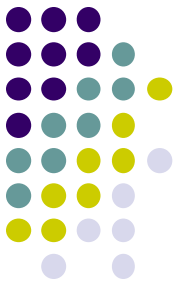
# Content

- Chapter 1 Basic Structure of Computers
- Chapter 9 Arithmetic
- Chapter 8 The Memory System
- Chapter 2 Machine Instructions and Programs
- Chapter 5 Basic Processing Unit
- Chapter 6 Pipelining
- Chapter 3 Basic Input/Output



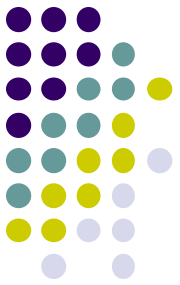
# Computer Architecture

- Computer architecture refers to those attributes of a system visible to a programmer, or put another way, those attributes that have a direct impact on the logical execution of a program.
- Examples of architectural attributes include:
  - The instruction set
  - The number of bits used to represent various data types (e.g., numbers, characters)
  - I/O mechanisms
  - Techniques for addressing memory
  - ...



# Computer Organization

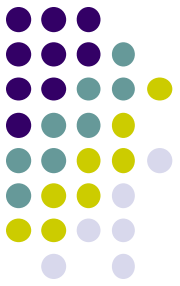
- Computer organization refers to the operational units and their interconnections that realize the architectural specifications.
- Organizational attributes include those hardware details transparent to the programmer, such as
  - control signals
  - interfaces between the computer and peripherals
  - the memory technology used
  - ...



# Examples

- Example1: Multiply Instruction
  - It is an architectural design issue **whether a computer will have a multiply instruction.**
  - It is an organizational issue **whether a multiply instruction will be implemented by a special multiply unit or by a mechanism that makes repeated use of the add unit of the system.**

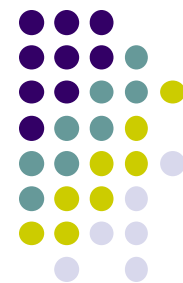
# Examples



- Example2
  - The same computer architecture can correspond to multiple different computer organizations, and the most typical example is **family computer** (系列计算机).
  - Computer architecture: the family of the computers  
Computer organization: the different models of computers within the family



# Teaching Materials and Reference Books



- Carl Hamacher, *Computer Organization and Embedded System*, 第6版, 机械工业出版社.



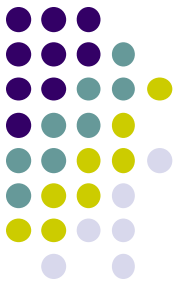
# Teaching Materials and Reference Books



## Reference Books

- William Stallings, *Computer Organization and Architecture-Designing for Performance*, 英文版第10版, 机械工业出版社.
- Andrew S. Tanenbaum and Todd Austin, *Structured Computer Organization*, 英文版第6版, 机械工业出版社.
- David A. Patterson and John L. Hennessy, *Computer Organization and Design-The Hardware/Software Interface*, 英文版第6版(MIPS), 机械工业出版社.

# Assessment



- Final Exam: 60%
- Experiments: 20%
- Homework&Attendance: 20%



# 学习方法

1. 学习本课程必须弄清硬件系统各部件的组成及工作原理，要在理解的基础上记住有关的工作原理、概念和术语。
2. 解决好各章的顺序渐进学习和各部分紧密相关的问题，围绕“整机概念”这一最大的难点主动地学习。
3. 理论联系实际，重视计算机组成原理实验的学习。
4. 认真听课，按质完成一定量的习题，解决似懂非懂的问题。
5. 不要把“计算机组成原理”作为纯粹的硬件课程来学习。