

**CS 315: Computer Organization and Low-Level Programming  
Spring, 2018**

**Class Schedule: Van Gogh, Tuesday 5:00-6:20PM, Thursday 5:00-6:20AM**

**Charles Duba, x4426 [duba@digipen.edu](mailto:duba@digipen.edu)**

**Office Hours: 2-3pm Tuesdays, Thursdays**

**Other times available upon request... Try my office, I just might be there.**

In order to make sure your email is reviewed, please start the subject with:

CS315student:

As in:

**From: Teemo Yordle**

**Subject: CS315student: Overestimated the power of scout code.**

**Course Description:**

This course introduces students to modern microprocessor architectures using the ARMv8 series for case studies. In this course, students are expected to write both assembly language programs and to use assembly language to optimize various C/C++ programs. Topics may include memory maps, pipelining, superscalar/ VLIW machines, register-renaming, out-of-order execution, multi-core architecture, caches, multicore-cache coherency, application binary interfaces, Flynn's taxonomy, and Streaming SIMD extensions.

**Learning Outcomes:**

Students should develop an understanding of basic instruction set design. Through use of the ARMv8 assembly language and C, they should acquire a deeper understanding of the relationship between the code that they write and the code that the computer executes. Students should also learn how memory architecture effects the performance of code, and how their choices can effect that performance. The knowledge presented in this course should enable more forward-compatible code design and allow students to better approach code optimization with a machine-level view.

**Text:**

*Computer Organization and Design – The Hardware/Software Interface – ARM Edition*,  
Patterson/Hennessy, ISBN:978-0-12-801733-3

**Grading: (tentative)**

Assignments	40%
Midterm	25%
Final	35%

**Tentative Weekly Topic Outline:**

Week 1: Introduction, review, and quantitative performance measures  
Week 2: ARM Instruction Set Architecture- what, how, and a bit of why  
Week 3: Assembly: Operations and Operands  
Week 4: Immediates and Addressing, Arm instruction set review  
Week 5: Addition and Subtraction. Multiplication and Division.  
Week 6: Floating point, representations, operations and design.  
Week 7: Midterm  
Week 8: Hardware for ALUs: Adders, and sequential circuits  
Week 9: CPU Design, datapath  
Week 10: Pipelining  
Week 11: Data and Control Hazards  
Week 12: Memory and Cache hierarchies, performance evaluations  
Week 13: Multiprocessor and Multi-core systems  
Week 14: Time permitting: Parallelism and more  
Week 15: Final Exam

**Attendance policy:**

Attendance will be taken at every class session.

**Disabled Student Services:** If students have disabilities and will need formal accommodations in order to fully participate or effectively demonstrate learning in this class, they should contact the Disability Support Services Office at (425)629-5015 or [dss\[at\]digipen\[dot\]edu](mailto:dss@digipen.edu). The DSS Office welcomes the opportunity to meet with students to discuss how the accommodations will be implemented. Also, if you may need assistance in the event of an evacuation, please let the instructor know.

**Academic Integrity Policy:** Although I encourage you to discuss your ideas with others inside and outside of this class, you need to independently create your programs. If you receive a significant amount of help from anyone, please credit them in your starting comments. To prevent plagiarism, you should not examine another cs315 student's code, nor should you allow your code to be seen by another student. Copying or plagiarizing code, papers, or presentations; cheating; and/or academic dishonesty in any form will not be tolerated in this course. Penalties for such behaviors may include receiving no credit for an assignment, a failing grade in the course, or even expulsion from the institution (DigiPen). For further details please consult the DigiPen Academic Integrity Policy.