**Comp Sci XXX – Introduction to Programming in Rust**

Welcome to Comp Sci XXX!

**Course Documents:**

There is one **required** document available: <https://doc.rust-lang.org/book/title-page.html>. It is also suggested that students reference the following (a more *gentle* introduction to Rust): <https://stevedonovan.github.io/rust-gentle-intro/>

**Instructor Contact Information:**

**Course Description:**

This course will teach students not only the fundamentals of programming in Rust, but also how to become a memory-safe developer. As memory safety becomes a [national concern](https://www.whitehouse.gov/oncd/briefing-room/2024/02/26/memory-safety-statements-of-support/#:~:text=By%20taking%20an%20engineering%2Dfirst,part%20to%20defend%20against%20daily), languages like Rust are rising in popularity and importance. In this course we will discuss the birth of Rust, its primary advantages, and disadvantages, as well as how its usage can be important today. Through a mix of classroom learning and practical application, we will create Rust (read: memory-safe) programs, and prepare for current and future software challenges.

**Course Objectives:**

By the end of this course, a successful student will:

1. Be proficient in the Rust programming language.
2. Analyze and create memory-safe applications.
3. Apply Rust to concurrent and network programming.
4. Evaluate the advantages of Rust in specific use cases and produce practical applications.

**Course Policies:**

**FIX**

**Graded Events**

**FIX**

**Expectations**

You are ultimately responsible for your own learning! You are asked (but not required) to engage with the material to the best of your ability.

**CS XXX – Introduction To Programming in Rust – Spring 2024**

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| **Lsn** | **Date** | **Reading** | **Topic** | **Assignments** |
| **1** | 1/8-9 | 1.1 - 1.2 | Introduction to Algorithms |  |
| **2** | 1/10-11 | 1.3 | Analysis of Algorithms |  |
| **3** | 1/12, 16 | 1.4 - 1.5 | Order of Magnitude Complexity |  |
| **4** | 1/17-18 | A.1–4 | Limit Theorem, Math Review |  |
| **5** | 1/19, 22 | B.1, B.3 | Recurrence Equations - Induction, Substitution |  |
| **6** | 1/23-24 | B.2.1 | Recurrence Equations - Linear, Homogeneous | HW1 (25 pts, Lsns 1-4) |
| **7** | 1/25-26 | B.2.2 | [Recurrence Equations - Linear, Non-Homogeneous](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn09) |  |
| **8** | 1/29-30 | B.4 | [Recurrence Equations - Master Theorem](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn10) |  |
| **9** | 1/31, 2/1 | 2.1 - 2.2 | [Divide-and-Conquer](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn11) - Coins Problem, Merge Sort | HW2 (25 pts, Lsns 5-8) |
| **10** | 2/2, 5 | 2.3 | [Divide-and-Conquer](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn12) - Trominos |  |
| **11** | 2/6-7 | 2.4 | [Divide-and-Conquer](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn13) - Analysis and Thresholds |  |
| **12** | 2/8-9 | 3.1 - 3.2 | [Dynamic Programming](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn15) - Binomial Coefficients |  |
| **13** | 2/12-13 | 3.3 | [Dynamic Programming](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn17) - Floyd’s Algorithm | HW3 (50 pts, Lsns 9-11) |
| **14** | 2/14-15 | [**Graded Review #1 (Lessons 1-11)**](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn16) | | |
| **15** | 2/16, 20 | 3.4 | [Dynamic Programming](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn18) – Chained Matrix Multiply |  |
| **16** | 2/21-22 | 3.5 | [Dynamic Programming](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn19) - Optimal Binary Trees |  |
| **17** | 2/26-27 | 3.6 | [Dynamic Programming](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn20) - Traveling Salesman Problem |  |
| **18** | 2/28-29 | 4.1 | [Greedy Method](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn21) - Spanning Trees | HW4 (50 pts, Lsns 12-17) |
| **19** | 3/1, 4 | 4.2 | [Greedy Method](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn21) - Dijkstra’s Single Source Shorts Paths |  |
| **20** | 3/5-6 | 4.4 | [Greedy Method](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn21) - Huffman Codes |  |
| **21** | 3/7-8 | 4.5 | Greedy vs. Dynamic Programming & 0-1 Knapsack |  |
| **22** | 3/11-12 | 5.1 - 5.2 | [Backtracking](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn25) - N Queens | HW5 (50 pts, Lsns 18-21) |
| **23** | 3/13-14 | [**Graded Review #2 (Lessons 12-21)**](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn16) | | |
| **24** | 3/18-19 | 5.5 | [Backtracking](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn26) - Graph Coloring |  |
| **25** | 3/20-21 | 5.6 | [Backtracking](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn27) - Hamiltonian Circuits |  |
| **26** | 3/22-4/1 | 5.7 | [Backtracking](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn27) - 0-1 Knapsack |  |
| **Spring Break (23-31 March)** | | | | |
| **27** | 4/2-3 | 6.1 | [Branch-and-Bound](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn30) - 0-1 Knapsack Problem |  |
| **28** | 4/4-5 | 6.2 | [Branch-and-Bound](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn31) - Traveling Salesman Problem |  |
| **29** | 4/8-9 | 7.1, 7.8 | [Computational Complexity](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn32) | HW6 (50 pts, Lsns 22-28) |
| [**30**](file:///\\eim.usafa.edu@SSL\DavWWWRoot\academics\compsci\cs364\Shared%20Documents\Lesson%20Materials\Lsn35-MS-Access-Demo.accdb) | 4/10-11 | [**Graded Review #3 (Lessons 22-28)**](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn16) | | |
| [**31**](file:///\\eim.usafa.edu@SSL\DavWWWRoot\academics\compsci\cs364\Shared%20Documents\Assignments\Demo.php) | 4/12, 15 | 9.1 - 9.3 | [Computational Complexity - Intro to NP](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn34) |  |
| [**32**](file:///\\eim.usafa.edu@SSL\DavWWWRoot\academics\compsci\cs364\Shared%20Documents\Assignments\Demo.php) | 4/16-17 | 9.4 | [Computational Complexity - NP-Complete](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn35) |  |
| [**33**](file:///\\eim.usafa.edu@SSL\DavWWWRoot\academics\compsci\cs364\Shared%20Documents\Lessons\Lsn30-Indexing.docx) | 4/18-19 |  | [Computational Complexity - NP-Complete](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn35) Reductions |  |
| [**34**](file:///\\eim.usafa.edu@SSL\DavWWWRoot\academics\compsci\cs364\Shared%20Documents\Lessons\Lsn31-Transaction-Processing.docx) | 4/22-23 |  | Ethics Lesson - Traveling Salesman - The Movie |  |
| [**35**](http://www.w3schools.com/php/php_mysql_delete.asp) | 4/24-25 | 12.1 | [Parallel Algorithms](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn38) - Models and Interconnections | HW7 (25 pts, Lsn 29-33) |
| [**36**](file:///\\eim.usafa.edu@SSL\DavWWWRoot\academics\compsci\cs364\Shared%20Documents\Assignments\CS364_PEX3_S11_Part1.docx) | 4/29-30 |  | [Parallel Algorithms](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn39) – Task Graphs, Map/Reduce | Ethics Essay (50 pts) |
| [**37**](file:///\\eim.usafa.edu@SSL\DavWWWRoot\academics\compsci\cs364\Shared%20Documents\Lesson%20Materials\Lsn35-MS-Access-Demo.accdb) | 5/1-2 | 12.2 | [Parallel Algorithms](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn39) - PRAM CRCW |  |
| [**38**](file:///\\eim.usafa.edu@SSL\DavWWWRoot\academics\compsci\cs364\Shared%20Documents\Assignments\CS364_PEX3_S11_Part1.docx) | 5/3-6 |  | DNA Storage & Computing, Quantum Computing | HW8 (25 pts, Lsns 35-37) |
| [**39**](file:///\\eim.usafa.edu@SSL\DavWWWRoot\academics\compsci\cs364\Shared%20Documents\Lesson%20Materials\Lsn35-MS-Access-Demo.accdb) | 5/7-8 | [**Graded Review #4 (Lessons 29-37)**](https://eis.usafa.edu/academics/compsci/CS380/Shared%20Documents/Lsn16) | | |
| **40** | 5/9-10 |  | Course Review and Critiques, Final Exam Prep |  |
| **Final Exams**  **Details to Follow** | | | | |

**Last Updated: 12/5/2023**