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|  | **DEPARTMENT OF THE AIR FORCE** THE DEPARTMENT OF COMPUTER SCIENCEUSAF ACADEMY, COLORADO |  |

January 10th 2024

MEMORANDUM FOR DFCS CURRICULUM COMMITTEE

FROM: Enrique Oti, Ethan Chapman, Rylie Anderson, David Petzold

SUBJECT: CS499 Independent Study Proposal: Modern Software Development with Rust

1. Cadet Enrique Oti, Cadet Ethan Chapman, Cadet Rylie Anderson and Cadet David Petzold request permission to take a CS 499 with Lt Col McGinthy to learn secure programming practices and perform research in the Rust programming language to create a course curriculum designed for USAFA Cadets. This proposal describes the scope of work in consideration for 3 credit hours.
2. **Course Objectives**. The proposed CS 499 will focus on developing the cadet’s knowledge and experience with the following Computer and/or Cyber Sciences concepts:
   1. Why Rust was created, use cases, pros and cons
   2. Basic Rust Syntax
   3. Memory Model and Ownership
   4. Error Handling
   5. Iterators
   6. Asynchronous Programming and Concurrency
   7. Network Programming
3. Proposal: This course will involve a mix of theoretical learning and practical application. Cadets will develop lesson plans, lesson exercises, and small to medium-sized projects to solidify their understanding of Rust programming concepts. Regular assignments and quizzes will also be part of the coursework to ensure continuous learning and assessment.

* Resources required:
  + Any Rust-compatible IDE
  + GitHub Classroom for project/homework submissions and autograding

1. **Schedule and Deliverables**. The following table describes the schedule and deliverables for this study

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| Week | Date | Description | | Deliverable(s) |
| 0 | 8-10 Jan 2024 | Course Introduction and Rust Setup | | Environment Setup Verification |
| 1-3 | 15-31 Jan 2024 | Basic Rust Syntax and Functions | | Simple Command-Line Application  Develop Lesson Plans (1-10)  Develop Lab Exercises (1-10) |
| 4-6 | 5-21 Feb 2024 | Memory Safety and Management in Rust | | Memory Management Homework  Develop Lesson Plans (11-20)  Develop Lab Exercises (11-20)  Develop Assessment 1 |
| 7-10 | 26 Feb - 20 Mar 2024 | Concurrent Programming | | Multi-threaded Application PEX  Develop Lesson Plans (21-30)  Develop Lab Exercises (21-30) |
| 11-13 | 25 Mar - 10 Apr 2024 | Network Programming with Rust | | Basic Client-Server Application PEX  Develop Lesson Plans (31-40)  Develop Lab Exercises (31-40)  Develop Assessment 2 |
| 14 | 15-17 Apr 2024 | Final Project Development | | Final Project Prototype |
| 15 | 22-24 Apr 2024 | Course Review and Final Presentation Preparation | Draft Presentation | |

1. **Course Outcomes**.
2. Proficiency in Rust programming language.
3. Ability to develop and manage memory-safe applications.
4. Skills in concurrent and network programming using Rust.
5. Develop lesson plans and exercises tied to course objectives
6. Develop programming assessments to ensure students are understanding concepts and objectives in controlled environment
7. Development of practical applications demonstrating Rust's capabilities.
8. Cadets will deliver model assignments and assessments focusing on Rust, based on the course objectives described above.
9. **Recommendation**. This course proposal presents an opportunity for cadets to engage with a modern, safe, and powerful programming language. The balance of theoretical and practical learning will provide a comprehensive understanding of Rust, equipping cadets with skills relevant to contemporary software development challenges. Approval of this proposal is respectfully requested.

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C2C Enrique Oti

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C3C Ethan Chapman

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C2C Rylie Anderson

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C3C David Petzold

1st Endorsement

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Independent Study Advisor

2nd Endorsement

Coord

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Research Director

3rd Endorsement

Coord

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Curriculum Committee Chair

4th Endorsement

Approval/Disapproval

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Department Head