# Introduction to Software Engineering

**AERSP 440**  
Spring Semester, 2009

Prof. Lyle N. Long

1:25 - 2:15 PM, Mon., Wed., and Fri.  
160 Willard Building

## Background
- Introduction
- Requirements
- Design
- Development
- Languages
- V & V
- Management
- Standards
- Speakers
- CSDA Exam
- Conclusions
- Appendix

## Links
4839 Hits
LECTURE MATERIAL FOR COURSE

Note: The detailed course notes are only available to students in the course and are copyrighted.

- Roadmap of Course:

- Background Information (1 Lecture)
  - First Day Info
  - Syllabus
  - Webpage for Author of Textbook (Ian Sommerville)
  - Computational Science Graduate Minor
  - Information Science and Technology UnderGraduate Minor for Aerospace Engineers
  - Read:
    - The Five Pillars of Aerospace Engineering, by L. N. Long
    - CrossTalk Journal paper, by L. N. Long
    - The Role of Software in Spacecraft Accidents, by N. Leveson
    - Feb. 2007 F-22 software problem: Associated Press and CNN
  - More info:
    - AIAA Software Systems Technical Committee
    - All AIAA Technical Committees
    - Workshop on High Confidence Aerospace Software (2006)
    - IEEE Computer Society SE Portal
- Penn State Great Valley, Software Engineering Graduate Program
- Carnegie-Mellon (SWE Institute)
- Important Computing Subjects and Skills, by S. Surakka
- Paper describing MIT SWE Course, by K. Lundqvist and J. Srinivasan
- Current Status of SWE Degree Programs, by D. J. Bagert and X. Mu
- Software and Higher Education, by J. C. Knight and N. G. Leveson

- **Project** (? Lectures)
  - Project Description
  - Dates

- **Introduction** (7 Lectures)
  - Motivation and Overview of Software Engineering
  - Introduction to Software Engineering (Chap. 1)
  - Socio-Technical Systems (Chap. 2)
  - Critical Systems (Chap. 3)
  - Software Processes (Chap. 4)
  - Project management (Chap. 5)
  - Facts and Fallacies book by R. L. Glass
  - Interesting Videos
  - Read:
    - Chap. 1-5 of Sommerville Textbook
    - Chap. 1 of SWEBOK
  - Additional Material:
    - Software Engineering Certification
    - *The Mythical Man Month* by Fred Brooks
    - Integrating "Crisis" into Project Management Training, CrossTalk Journal, Feb., 2000
    - USAF OPERATIONAL RISK MANAGEMENT

- **Requirements** (4 Lectures?)
  - Concept of Operations (CONOPS)
  - Software Requirements
  - Requirements Engineering Processes
  - System Models
  - Critical Systems Specification
  - Formal Specification
    - Formal Methods (if we have time)
  - Read:
    - Chap. 6-10 of Sommerville Textbook
    - Chap. 1 and Sect. 2.1 of: A Gentle Introduction to Software Engineering," USAF
    - Chap. 2 of SWEBOK
    - IEEE Standard 830-1998 (on reserve in Engineering Library)

- **Midterm #1**, Feb. 25, in class (1 period)
- Min: 49, Max: 99, Average: 81, [image]
- Covers Chap. 1-10, all notes, lectures, homework, and all reading assignments

- **Design** (5 Lectures?)
  - **Architectural Design**
  - **Distributed Systems**
  - Application Architectures (will probably skip this, Chap. 13)
  - **Object Oriented Design** (read also: UML slides)
  - **Real-time System Design**
  - **User Interface Design**
  - Read:
    - Chap. 11-12 and 14-16 of Sommerville Textbook
    - Sect. 2.3 of: *A Gentle Introduction to Software Engineering*, "USAF
    - Article on CORBA

- **Spring Break, Mar. 9 - 13, 2009**

- **Code Development**
  - Notes from Sommerville book: (3 Lectures?)
    - **Rapid Software Development** (Chap. 17)
    - **Software ReUse** (Chap. 18)
    - Component-Based Software (Chap. 19), we will skip this chapter
    - **Critical Systems Development** (Chap. 20)
    - **Software Evolution** (Chap. 21)
  - Languages (5 Lectures?)
    - **Ada Lectures by Dr. Dewar**
    - **Ada Intro Slides** (more info on Ada)
    - **Object Oriented Programming (OOP)**
    - **Example OOP Java Code** (Images Required)
    - **FORTRAN**
    - **Writing the Programs** (from Pfleeger and Atlee)
    - Unified Modeling Language (UML) (More info)
  - Read:
    - Chap. 17, 18, 20, and 21 of Sommerville Textbook
    - Sect. 2.4 of: *A Gentle Introduction to Software Engineering*, "USAF
    - Pages 41-61 (Guidelines for Choosing a Computer Language) *A Gentle Introduction to Software Engineering*, "USAF
    - Appendices E thru L of *A Gentle Introduction to Software Engineering*, "USAF

  - See also: **AIAA COTS Guidebook**

- **Verification and Validation** (2 Lectures?)
  - **Verification and Validation**
  - **Software Testing**
Read:
- Chap. 22 & 23 of Sommerville Textbook
- Sect. 2.5 of: A Gentle Introduction to Software Engineering," USAF

- **Management** ( 2 Lectures? )
  - Managing People
  - Software Cost Estimation
  - Read:
    - Chap. 25 and 26 of Sommerville Textbook
    - Crosstalk article on cost estimates, May, 2007

- **Midterm #2** , Apr. 10, in class (1 period)
  Covers ALL material after Midterm #1 thru Apr. 8
  (closed book and notes)

- **Software Standards** ( 3 Lectures? )
  - IEEE
    - IEEE Software Standards
    - IEEE Software Standards Site
  - DO-178B
    - Introduction
    - I will discuss DO-178B in class but cannot give out copies of it
    - FAA Circular AC20-115B
    - FAA Order No. 8110.49
    - Intro to DO-178B
    - DO-178B on Wikipedia
    - Paper on DO-178B by L. A. Johnson
    - How to Obtain DO-178B ( RTCA main website )
    - Courses on DO-178B
  - FAA
    - Type Certificates (TC)
    - Supplemental Type Certificate (STC)
    - Technical Standard Orders (TSO)
  - AIAA
    - The Risks of Using COTS Products in Mission Critical Systems (i.e. the COTS Guidebook)
    - Other AIAA standards

- **Register for CSDA exam by June 27, 2009 !!**

- **Conclusions**

- **Appendix**