

# ENMA 660 – System Architecture and Modeling

Fall 2009, Monday 16:20 PM – 19:00 PM

## Instructor:

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Office Hours:	Monday	1:00PM - 4:00PM
	Thursday	9:00AM - 1:00PM

## Overview

Students will learn the essential aspects of the systems architecture paradigm through development and analysis of multiple architecture frameworks and enterprise engineering, such as IDEF0, TOGAF, DoDAF, and OPM. Emphasis is placed on systems modeling and enterprise engineering in support of system-of-systems challenges. The course will start with mathematical foundations (discrete mathematics and graphs) and will lead to an exemplifying system model using a professional software package. The course teaches the basics of system modeling required for successful engineering of systems as well as the use of M&S in support of this process.

Topics of class components are

- Overview System Modeling and Architecture
- The System Engineering Design Process for Complex Systems, Virtual Systems and Systems-of-Systems
  - Modeling of Systems and Architecting Paradigms
  - Overview of Modeling Techniques:
    - Graphical Modeling
    - Set Theory, Relations, and Functions
    - Graph Theory
  - Capturing and Modeling of Requirements
  - Functional, physical, and operational Architectures
- Frameworks and Standards
  - Department of Defense Architecture Framework (DODAF)
  - Alternative Frameworks
    - Zachman
    - System Modeling Language (SysML)
    - Object-Process Methodology (OPM)
    - The Open Group Architecture Framework (TOGAF).
- Special Topics
  - Virtual System Challenges
  - System-of-System Modeling Challenges

Where feasible, guest speakers will talk about practical applications and experiences.

Every student will have access to the Vitech Software CORE 5.0. This software is needed for homework assignment and the in-class project.

## **Objectives**

The student will be exposed to the fundamental methods and techniques for system modeling and architecting. He will be introduced to supporting frameworks and standards and learn about their strengths and shortcomings. At the end of the course, the student should understand which methods and techniques can be used to support modeling and architecture of complex system, virtual systems, and system-of-systems.

## **Text and Class Material**

For the introduction and theoretic sections, the following textbook is mandated:

- Dennis M Buedde (2000) The Engineering Design of Systems, Models and Methods. Wiley Series in Systems Engineering, John Wiley and Sons, Inc.

Additional reading assignments will be distributed during classes where necessary.

For the practical examples, the academic version of CORE 5.0 of Vitech Corporation is necessary. It will be addressed in class how to obtain and install this software.

Access to Blackboard (<http://blackboard.odu.edu>) is mandatory. Additional course materials, handouts, slides, etc. will be available via Blackboard.

## **Examinations, Homework Assignments, Projects**

- Homework assignments are given in class
- An in class interim examination (closed book, closed notes) will be conducted October 19, 2009
- Each student will contribute to a class project using the CORE 5.0 software for an architecting assignment
- The final examination is a take home examination that will be distributed on November 23, 2009 and that needs to be finalized by December 14, 2009
  
- PhD students have to submit paper (app 5,000 words) on a special topic of interest and have to present this paper in class (app 20-25 min presentation followed by an open discussion)

## **Grading Distribution**

**Master** students will be graded based on the following efforts (100 points total):

25% Interim Examination

25% Final Examination

25% Project Contribution

25% Class and Homework Contributions

**PhD** students will be graded based on the following efforts (100 points total):

- 20% Interim Examination
- 20% Final Examination
- 20% Project Contribution
- 20% Class and Homework Contributions
- 20% Paper submission and presentation

No extra points will be given.

### **Grading Scale**

<b>Grade</b>	<b>Points</b>	<b>Grade</b>	<b>Points</b>	<b>Grade</b>	<b>Points</b>
		<b>A</b>	95-100	<b>A-</b>	90-94
<b>B+</b>	87-89	<b>B</b>	83-86	<b>B-</b>	80-82
<b>C+</b>	77-79	<b>C</b>	73-76	<b>C-</b>	70-72
<b>F</b>	<70				

### **Course Schedule**

Classes will be conducted on Aug 31, Sep 7, Sep 14, Sep 21, Sep 28, Oct 5, Oct 19 (Interim), Oct 26, Nov 2, Nov 9, Nov 16, Nov 23, and Nov 30.

Selected classes will be pre-taped and broadcasted instead of live classes. These events will be announced in advance in class as well as on Blackboard. All classes will be taped and can be reviewed by students.

### **Academic Calendar Fall 2009**

29 August	Classes begin
4 September	Last day to DROP a course with no grade assigned
	Last day to DROP and receive full tuition refund or credit
8 September	Last day to ADD a course
11 September	Last day to withdraw and receive half-tuition refund or credit
10-13 October	Fall Break
11 December	Classes end
12-18 December	Examination
19 December	Fall Commencement