New M&S Education Opportunities:
How to help your users be smarter customers of M&S

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Project Overview

Project Outcomes

- Overall Deliverable Description
- Course Descriptions
- Availability
- Credit

Summary
Project Overview
M&S could better realize its potential for cost savings in DoD.

- Users of M&S need to better understand how to employ M&S more effectively.
  - Which tools to use, when to use them, how to use them, how to get them.
  - Risk and benefits of using M&S need to be better understood.

- Pre existing educational gaps need to be filled.
  - Education can help drive wider acceptance and use of M&S.
In 2006, the Defense Modeling and Simulation Coordination Office and the Navy Modeling and Simulation Office tasked the Naval Postgraduate School to develop an M&S curriculum focused on the users of M&S, specifically those in DoD Acquisition and Test and Evaluation (T&E). Recently, in 2008 the US Army jumped on board with vested interest in the project.
NPS partnered with seven of the best academic institutions to develop a lifelong learning suite for acquisition and T&E professionals in Modeling and Simulation.
• Develop educational offerings using the best US university talent

• Make them widely available
  – University Courses
  – Short courses
  – Web
  – DAU CLMs
  – Public domain
Why start with Acquisition?
128,000 workforce members controlling over $150B/year*

Project Outcomes
**Project Deliverables**

### 16 Academic Courses

- M&S in the Acquisition Life Cycle Part One
- M&S in the Acquisition Life Cycle Part Two
- M&S Strategy and Support Plans
- M&S Requirements and Evaluating M&S Proposals
- Contracting for M&S
- Best Practices in M&S
- M&S in Decision Risk Analysis and Risk Mitigation
- M&S Environments
- M&S Data Strategies
- M&S for Test and Evaluation, Introduction
- M&S for Test and Evaluation, Advanced
- Introduction to Engineering M&S Applications
- *Introduction to Physics Based M&S*
- *Basic Engineering Concepts in M&S I*
- *Basic Engineering Concepts in M&S II*
- *Selected Topics in the Application of Engineering M&S*

### 10 CLMs

- M&S Strategy and Support Plans
- M&S Requirements and Evaluating M&S Proposals
- Contracting for M&S
- Best Practices in M&S
- M&S in Decision Risk Analysis and Risk Mitigation
- M&S Environments
- M&S Data Strategies
- M&S for Test and Evaluation, Introduction
- M&S for Test and Evaluation, Advanced
- Introduction to Engineering M&S Applications

**Plus –**

### 10 Engineering Case Studies

- Acquisition Manager’s Guide to M&S
- Longitudinal Assessment Plan

*Funded by Navy and Army sponsors*

02/25/09  Modeling and Simulation Education for the Acquisition and T&E Workforce
Description:

- Two-course series (Parts 1 and 2) developed by GMU and UCF
- Upon completion, students will be able to describe the M&S used in each phase of the Acquisition Life Cycle.

Learning objectives:

- Identify a particular tool and apply it appropriately to the correct point in the lifecycle.
- Relate specific tools to the decision points that separate the acquisition phases.
- Identify sustainment and training support M&S for a representative system.
- Understand through case studies how industry Simulation-Based Life Cycle Engineering concepts are integrated into phases of the lifecycle.

Target Audience:

- Acquisition managers who need to understand what types of tools are available at each phase of the life cycle.
Current projected course offerings:

- GMU – One 5-day short course covering entire lifecycle
  - September 21-25, 2009, in Arlington, VA, or by contract, $2150 per student
  - To register, contact –
    
    For Open Enrollment: Christine Satorre, Program Manager, 703-993-4801, csatorre@gmu.edu
    For Contract Training: Susan Stinson, Contract Training Coordinator, 703-993-4802, sstinson@gmu.edu

- ODU – Two short courses offered by WernerAnderson
  - Part One – October 2009, Hampton Roads, VA, $1995 per student
  - Part Two – December 2009, Hampton Roads, VA, $1995 per student
  - To register, contact M&STraining@werneranderson.com

- UCF – Full semester course focused on industry perspective and case studies
  - For more information please see UCF catalog and registrar, www.ucf.edu.

- NPS – Quarter long courses offered as part of new “M&S Management” certificate program.
  - Specific offering information pending, $1750 per course.
  - For information please contact Dr. David H. Olwell, dholwell@nps.edu
Description:

- This course introduces acquisition workforce professionals to M&S, M&S planning, and the generation of support plan documents.

Learning objectives:

- Define and identify the benefits of M&S and its application to the understanding, use and evaluation of M&S planning.
- Develop an integrated Simulation Support Plan (SSP), System Engineering Plan (SEP), and Test and Evaluation Master Plan (TEMP).
- Specific focus areas include: the M&S planning process and its relationship to life cycle phases of development and acquisition milestone decisions; program cost, schedule and performance considerations; trade-off decisions; and effectiveness assessment.

Target Audience:

- Acquisition managers who need to understand how to plan for M&S and integrate M&S throughout system acquisition, development and/or T&E.
Current projected course offerings:

- UCSD – Quarter long course offered as part of Defense Technology Certificate program
  - Spring 2009, live at UCSD Extension, $695 per course
  - For more information, go to [http://extension.ucsd.edu/defensetech](http://extension.ucsd.edu/defensetech)

- ODU – Short course offered by WernerAnderson
  - July 2009, Hampton Roads, VA, $1995 per student
  - To register, contact [M&STraining@werneranderson.com](mailto:M&STraining@werneranderson.com)

- NPS – Quarter long courses offered as part of new M&S Acquisition certificate program.
  - Specific offering information pending, $1750 per course.
  - For information please contact Dr. David H. Olwell, [dholwell@nps.edu](mailto:dholwell@nps.edu)
Description:

- This course enables the student to write good requirements for the acquisition of M&S and to properly evaluate proposals for M&S development.

Learning objectives:

- Compare M&S proposals, relative to measurable program contributions.
- Apply the decision making process on the appropriate program office level of expenditure on M&S tools throughout the program life cycle.
- Make decisions as to whether custom or off-the-shelf products will be best suited for the program’s purpose.
- Establish and write valid M&S requirements using a process that includes M&S needs analysis, generation of valid M&S requirements, functional decomposition and conceptual model development, and issuance of “built to” or “buy to” performance specifications.
- Understand how models and simulations evolve in fidelity, resolution, and scope as the program life cycle progresses.
Target Audience:

- Acquisition managers who will be involved in the solicitation and/or review of proposals for the development of M&S products.

Current projected course offerings:

- NPS – Quarter long courses offered as part of new M&S Acquisition certificate program.
  
  ➢ Specific offering information pending, $1750 per course.
  
  ➢ For information please contact Dr. David H. Olwell, dholwell@nps.edu
Description:

- This course enables the student to identify and plan for M&S-specific considerations when developing contracts for M&S product development.

Learning objectives:

- Recognize contracting issues for M&S products.
- Specific topics include intellectual property issues, delivery terms, maintenance responsibility, standards for documentation, open architecture, interoperability, reuse and other considerations.
Target Audience:

- Acquisition managers who will be involved in the acquisition of M&S products.

Current projected course offerings:

- NPS – Quarter long courses offered as part of new M&S Acquisition certificate program.
  - Specific offering information pending, $1750 per course.
  - For information please contact Dr. David H. Olwell, dholwell@nps.edu
Description:

• This course provides an overview of the best practices associated with various M&S development and management topics.

Learning objectives:

• Identify best practices and standards in modeling and simulation.
  ➢ Specific topic areas include: M&S planning, M&S tool development, M&S federation development, software development, VV&A, and M&S support plans.
• Manage and reuse existing models, data, and simulations appropriately and assure that new products developed are designed and prepared for reuse.
Best Practices in M&S (cont’d)

Target Audience:

• Acquisition managers who will be involved in the management of M&S development and use.

Current projected course offerings:

• ODU – Short course offered by WernerAnderson
  ➢ March 2009, Hampton Roads, VA, $1995 per student
  ➢ August 2009, San Diego, CA, $1995 per student
  ➢ To register, contact M&STraining@werneranderson.com

• NPS – Quarter long courses offered as part of new M&S Management certificate program.
  ➢ Specific offering information pending, $1750 per course.
  ➢ For information please contact Dr. David H. Olwell, dholwell@nps.edu
Description:

• This course is designed to educate and introduce the acquisition workforce professionals to M&S and its application to Decision Risk Analysis and Risk Mitigation.

Learning objectives:

• Use M&S to make informed engineering tradeoff analyses through a program’s Decision Risk Analysis process.

• General focus areas of this course include: application of experimental design, level of model detail, risk mitigation strategy development, evaluation of M&S outputs/measures, and M&S application as a pre-test prediction tool.

Target Audience:

• Acquisition managers who may benefit from the use of M&S in Decision Risk Analysis
Current projected course offerings:

- ODU – Short course offered by WernerAnderson
  - April 2009, Hampton Roads, VA, $1995 per student
  - July 2009, San Diego, CA, $1995 per student
  - November 2009, TBD
  - To register, contact M&STraining@werneranderson.com

- UCSD – Quarter long course offered as part of Defense Technology Certificate program
  - Summer 2009, live at UCSD Extension, $695 per course
  - For more information, go to http://extension.ucsd.edu/defensetech

- NPS – Quarter long courses offered as part of new M&S Acquisition certificate program.
  - Specific offering information pending, $1750 per course.
  - For information please contact Dr. David H. Olwell, dholwell@nps.edu
Description:

• This course covers architectures and attributes of M&S environments (live, virtual, and constructive) as well as interoperability approaches. Focus is on application and suitability for testing and acquisition applications.

Learning objectives:

• Define and choose between the different testing environments (live, virtual, and constructive).

• Describe approaches to testing and validating M&S for use in each environment and identify degree of accuracy typically required in each.

• Decide between a standalone or federation of interoperable simulations and define attribute values for various applications.

• List current simulation interoperability protocol standards and describe advantages and disadvantages of each in different environments.
Target Audience:

• Acquisition workforce members needing to better understand M&S environments used in testing and training applications.

Current projected course offerings:

• UAH – Semester long course offered as a special topic in the Industrial and Systems Engineering Department, Spring 2010.
  ➢ All courses offered resident and via distance learning.
  ➢ To apply, contact Dr. Mikel Petty, 256-824-4368, http://cmsa.uah.edu/

• NPS – Quarter long courses offered as part of new M&S in Test and Evaluation certificate program.
  ➢ Specific offering information pending, $1750 per course.
  ➢ For information please contact Dr. David H. Olwell, dholwell@nps.edu
Description:

• This course covers categories, uses, formats, and models of data for M&S, including acquiring, converting, preparing, controlling, securing, and distributing data. Focus is on application and suitability for testing and acquisition applications.

Learning objectives:

• List categories of typical M&S data sets and define requirements for volume, availability, accuracy, classification, storage and retrieval.

• Identify existing data resources available for reuse.

• Define commonly used data formats, describe how to assess data for utility in a specific application, and describe conversion approaches.

• Explain concepts of data models and how they relate to data sets.

• Specify proper security procedures for safeguarding classified data sets.
Target Audience:

- Acquisition workforce members needing to better understand M&S data strategies.

Current projected course offerings:

- UAH – Semester long course offered as a special topic in the Industrial and Systems Engineering Department, Spring 2010.
  - All courses offered resident and via distance learning.
  - To apply, contact Dr. Mikel Petty, 256-824-4368, http://cmsa.uah.edu/

- NPS – Quarter long courses offered as part of new M&S in Test and Evaluation certificate program.
  - Specific offering information pending, $1750 per course.
  - For information please contact Dr. David H. Olwell, dholwell@nps.edu
Description:

• These courses will address the use of M&S as a complement to physical testing in support of systems evaluation.

Learning objectives:

• Quantify the risk of using M&S in place of portions of live testing.
• Integrate M&S, live test, prototype data, historical data, component data, and scale model data into a coherent test.
• Describe the different types of testing and identify the utility, limitations and risks for use of M&S in each.
• Identify strategies for M&S use in test planning and execution.
• Match existing M&S T&E facilities used in the DoD to a given need.

Target Audience:

• Acquisition workforce members involved in test and evaluation.

02/25/09 Modeling and Simulation Education for the Acquisition and T&E Workforce
Current projected course offerings:

- **UAH** – Semester long course offered as a special topic in the Industrial and Systems Engineering Department,
  - Intro – Fall 2010
  - Advanced – Spring 2010
  - All courses offered resident and via distance learning.
  - To apply, contact Dr. Mikel Petty, 256-824-4368, [http://cmsa.uah.edu/](http://cmsa.uah.edu/)

- **ODU** – Short course offered by WernerAnderson
  - Intro - August 2009, Hampton Roads, VA, $1995 per student
  - Advanced - September 2009, Hampton Roads, VA, $1995 per student
  - To register, contact M&STraining@werneranderson.com

- **NPS** – Quarter long courses offered as part of new M&S in Test and Evaluation certificate program.
  - Specific offering information pending, $1750 per course.
  - For information please contact Dr. David H. Olwell, dholwell@nps.edu
Description:

• This course will introduce a wide array of engineering M&S tools to give acquisition professionals a general understanding of key capabilities available to support design processes.

Learning objectives:

• Describe M&S methods as they apply to various engineering disciplines.

• Investigated disciplines include basic structural mechanics, basic computational fluid dynamics (CFD), basic dynamics and controls, basic thermodynamics and heat transfer, basic materials and fabrication, basic acoustic and electromagnetics, military platform systems engineering, basic computer architectures supporting engineering, basic circuits and power systems, basic information transfer, principles of networks applied to military applications, basic terrestrial science, basic human systems integration in engineering design, and basic principles of aerodynamics.
Target Audience:

- Acquisition professionals who need a broader understanding of the available M&S tools used in various engineering disciplines.

Current projected course offerings:

- ODU – Short course offered by WernerAnderson
  - February 2009, Hampton Roads, VA, $1995 per student
  - June 2009, TBD, $1995 per student
  - October 2009, San Diego, CA, $1995 per student
  - To register, contact M&STraining@werneranderson.com
Description:

- This course will introduce basic concepts in the modeling of engineering systems.

Learning objectives:

- Produce a “computable” model.
- Understand basic concepts of:
  - System modeling and idealizations applied to physics-based engineering M&S
  - Physical quantities of physics-based engineering M&S
  - Engineering simulation applied to physics-based engineering M&S
  - Equations of engineering physics applied to physics-based engineering M&S
  - Simulation methods applied to physics-based engineering M&S
Target Audience:

- DoD non-technical acquisition professionals who do not have engineering or science degrees so that they can obtain a general understanding of key M&S capabilities necessary for design, analysis, and maintenance of engineering systems.

Current projected course offerings:

- NPS – Quarter long courses offered as part of new Engineering M&S certificate program, curriculum # 279.
  - Specific offering information pending, $1750 per course.
  - For information please contact Dr. Young S. Shin, yshin@nps.edu
Description:

- The topics covered in the course include structural mechanics, shock & vibrations, fluids, heat transfer & thermodynamics, dynamics and controls, and materials and fabrication.

Learning objectives:

- Understand basic concepts of:
  - Structural mechanics applied to physics-based engineering M&S
  - Shock & vibrations applied to physics-based engineering M&S
  - Fluid & thermal sciences applied to physics-based engineering M&S
  - Dynamics & controls applied to physics-based engineering M&S
  - Materials & fabrication applied to physics-based engineering M&S
Target Audience:

- This course will provide introductory concepts of various engineering topics to DoD non-technical acquisition professionals who do not have engineering or science degrees so that they can obtain a general understanding of key M&S capabilities necessary for design, analysis, and maintenance of engineering systems.

Current projected course offerings:

- NPS – Quarter long courses offered as part of new Engineering M&S certificate program, curriculum # 279.
  - Specific offering information pending, $1750 per course.
  - For information please contact Dr. Young S. Shin, yshin@nps.edu
Description:

- This course will provide introductory concepts of various engineering topics for key M&S capabilities necessary for design, analysis, and maintenance of computers, weapons platforms, and Electrical engineering systems.

Learning objectives:

- Understand basic concepts of:
  - Acoustical and electromagnetic wave propagation applied to physics-based engineering M&S.
  - Electrical engineering and machinery applied to physics-based engineering M&S.
  - Computer architectures and algorithms applied to physics-based engineering M&S.
  - Communication theory, command, and control applied to physics-based engineering M&S.
  - Sensors and weapon systems applied to physics-based engineering M&S.
Target Audience:

• DoD Modeling and Simulation workforce members supporting defense acquisition

Current projected course offerings:

• NPS – Quarter long courses offered as part of new Engineering M&S certificate program, curriculum # 279.
  - Specific offering information pending, $1750 per course.
  - For information please contact Dr. Young S. Shin, yshin@nps.edu
Description:

• This course provides an overview of how typical engineering modeling and simulation applications support the acquisition process. Investigations into the feasibility, utility, and risk of engineering M&S in each of the focus areas will be highlighted through the use of engineering case studies.

Learning objectives:

• Describe the application of basic engineering M&S concepts in:
  - Land Warrior / Vehicle Systems
  - Sea Based Systems
  - Aviation Systems
  - Space-Satellite Systems
Target Audience:

- Acquisition managers who will be involved in the acquisition of M&S products.

Current projected course offerings:

- NPS – Quarter long courses offered as part of new Engineering M&S certificate program, curriculum # 279.
  - Specific offering information pending, $1750 per course.
  - For information please contact Dr. Young S. Shin, yshin@nps.edu
Delivery of completed products anticipated on 28 February.

Planned delivery method:

- Products will be delivered via a secure web site.
- Once accepted by sponsors, organizations desiring the products can request a username/password through NPS to access the materials.
  
  ➢ *Note: access issues currently being worked with sponsors.*

CLMs will be delivered to DAU for evaluation and refinement as necessary.

- CLMs are subject to DAU process before they will be accessible through the DAU site.
- NPS will assist in the process as desired to ensure CLMs meet DAU requirements.
Course Offering Information

Resources Available Online

Course Syllabi

Printables

www.nps.edu/msacq

02/25/09
Questions?
MSA 0301 Modeling and Simulation throughout the Acquisition Lifecycle

Prerequisites Apply: ACQ 101, ACQ 201, and Essentials of Modeling and Simulation (MSCO online orientation)

George Mason University
Office of Continuing Professional Education
2214 Rock Hill Road
Suite 400
Herndon, VA 20170

Open Enrollment: Christine Satorre, Program Manager, 703-993-4801, csatorre@gmu.edu
Contract Training: Susan Stinson, Contract Training Coordinator, 703-993-4802, sstinson@gmu.edu

www.ocpe.gmu.edu

Available for earlier delivery via contractual agreement at client’s location

September 21-25, 2009
Arlington, VA
Live Classroom Only
$2150 per student
WernerAnderson Training
January-December 2009

Intro to M&S Using Arena (Jan. –Hampton Roads, May –San Diego, Sept. -TBD)
Intro to Engineering M&S Applications (Feb. –Hampton Roads, June –TBD, Oct. –San Diego)
Best Practices in M&S (March –Hampton Roads, August –San Diego)
Risk Mitigation and Decision Analysis (April –Hampton Roads, July –San Diego, Nov. -TBD)
M&S Support Plans (July –Hampton Roads)
M&S in the Acquisition Life Cycle, Part I (Oct. –Hampton Roads)
M&S in the Acquisition Life Cycle, Part II (Dec. –Hampton Roads)
Introduction, M&S for T&E (Aug. –Hampton Roads)
Advanced, M&S for T&E (Sept. –Hampton Roads)

Email: M&STraining@werneranderson.com

WernerAnderson Locations:
Hampton Roads, San Diego, 3rd location (TBD)
On-site training
$1995 per course
Fall 2009
M&S Environments and M&S for T&E, Intro
-ISE Special Topics Courses

Spring 2010
M&S Data Strategies and M&S for T&E, Advanced
-ISE Special Topics Courses

Fall 2010
UAH M&S Degree Program
*Pending approval.

http://cmsa.uah.edu/

UAH Industrial and Systems Engineering Department (ISE)
All courses will be available via Distance Learning.
256-824-4368 Telephone
Defense Technology Certificate Program

*Eight four-course tracks*

Analysis and Simulation Track


**Courses**

Defense Technology Overview (offered every quarter)

A/S I: Introduction to Analysis and Simulation (offered winter09, fall09)

A/S II: Program Strategy and Planning (offered spring09, winter10)

A/S III: Risk and Risk Mitigation (offered summer09, spring10)

http://extension.ucsd.edu/defensetech

Program begins each winter

UC San Diego Extension

Live Classroom Only

$695 per course
Four Certificate Programs

**M&S Acquisition**
- M&S Strategy and Support Plans
- M&S Requirements & Evaluating Proposals
- Contracting for M&S
- M&S in Decision Risk Analysis

**M&S Management**
- Intro to DoD M&S
- Best Practices in M&S
- M&S in the Acquisition Life Cycle, Parts 1 & 2

**M&S Test and Evaluation**
- M&S for T&E, Intro and Advanced
- M&S Environments
- M&S Data Strategies

**M&S Engineering Integration**
- Physics-based M&S
- Basic Engineering Concepts in M&S, Parts 1 & 2
- Selected Topics in M&S Engineering Applications

Certificate Programs
Dates: TBA
Available via Distance Learning
$1750 per course
M&S Education Project – Roadmap
Updated 1 August 2007

Learning
Architecture

Educational Skill
Requirements

Material
Development

For a complete set of 2007 deliverables, please see: https://diana.nps.edu/MSAcq/.