

Option-II Modified: M&S in Decision Risk Analysis and Risk Mitigation

- 1) Course name: M&S in Decision Risk Analysis and Risk Mitigation
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- 3) Course description: This course is designed to educate and introduce the acquisition workforce professionals to modeling and simulation (M&S) and the application of the Risk Analysis and Risk Mitigation process. This course will introduce the student to the concepts entailed in the use of M&S to make informed engineering tradeoff analyses through the 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.
- 4) Modules incorporated into the course:
A7, limited/modified P6
- 5) ESR's that the course supports and the corresponding level of achievement:
A7.1 (G, U, A, M)
A7.2 (G, U, A, M)
A7.3 (G, U, A, M)
A7.4 (G, U, A, M)
A7.5 (G, U, A, M)
P6.6 (G, U, A, M)
- 6) Prerequisites: This course is designed for DoD military and civilian professionals who are determined to be proficient to the apprentice, journeyman or expert level (as applicable) in their current job positions in the areas of program management, systems engineering and test and evaluation.
- 7) Course maturity: There is a 5-day course on Decision and Risk Analysis (SYS/SDOE 660) available from Stevens Institute of Technology, but it presents the core topics differently than this course. Therefore, this is a news risk analysis course that stresses the application of M&S.
- 8) Number of contact hours and pace contemplated: This 48 hour course will provide 5 CEU's. The class will meet 4 hours per week for 12 weeks. The hour breakdown for each level of competency is provided below:
 - a) General Awareness 4 hours
 - b) Understanding 8 hours
 - c) Application 16 hours (12 hr instruction; 3 hr project; 1 hr exam)
 - d) Mastery 20 hours (8 hr instruction; 10 hr project; 2 hr exam)

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9) Proposed delivery modality: face-to-face

10) Proposed references and texts:

[1] Risk Assessment and Decision Making in Business and Industry: a Practical Guide, by Glenn Koller, CRC Press, Boca Raton, Florida, 1999.

[2] Risk Management Guide for DoD Acquisition, 6th ed., V1.0, August 2006.

<http://www.sei.cmu.edu/risk/dod-risk.pdf>

Additional useful references:

[3] OPNAVINST 5200.34, Navy Modeling and Simulation (M&S) Management, 28 May 2002.

[4] Simulation Based Acquisition: A New Approach, Report of the Military Research Fellows, DSMC, 1997-1998.

11) Course learning objectives:

A7.1 Develop pre-test criteria and analyze/apply choices of design detail for desired performance factors for a selected application.

A7.2 Analyze outputs/measures from M&S tools for a given case study.

A7.3 Evaluate performance factors and interdependencies of outputs/measures based on a given set of case studies

A7.4 Identify and prioritize risk factors using the Decision Risk Analysis process.

P6.6 Develop a risk mitigation strategy for given case studies.

A7.5 Perform informed engineering tradeoff analyses through the Decision Risk Analysis process.

12) Course assessment plan:

1. Week 1 through week 12: In-class discussions to test competency at corresponding level of instruction.
2. Week 6: Class project based on case study to demonstrate students' ability to perform analysis at the application level.
3. Week 7: Mid term exam to test student competency at the application level.
4. Week 8-12: Class project based on case study to demonstrate students' ability to perform analysis and evaluation at the mastery level.
5. Week 12: Case study and final exam to test student's ability to perform analysis and evaluation at the mastery level.

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13) Topic list by hour of instruction and reference:

The 48 hour course is structured such that each hour is based on its required level of competency. This structure allows the course material to be provided as four separate groupings: General Awareness, Understanding, Application, and Mastery.

The Matrix below outlines the 12 modules of the 48 hour course. Each of the 12 modules is a 4 hour self contained instruction block.

Lvl	Wk	Course Title: M&S in Decision Risk Analysis and Risk Mitigation	Notes
G	1	Course Overview, Introduction to the M&S Risk Process	text, handouts, grading, case studies, [Class Project 1 hr]
U	2	Risk mitigation methodology, risk and the VV&A Process	Case studies and Risk examples [Class Project 1 hr]
U	3	M&S risk and the VV&A plan, new and legacy risk models	Examples and case studies [Class Project 1 hr]
A	4	M&S risk and accreditation JSEM case study	Step by step process case studies [Class Project 1 hr]
A	5	Quantifying risk assessment and the ship self defense case study	Step by step process case studies [Class Project 1 hr]
A	6	M&S Software development risk mitigation process	Step by step process case studies [Class Project 1 hr]
A	7	Class Project Presentations and Mid Term Exam	Mid term in-class grading and Draft project presentations
M	8	Analysis and evaluation of M&S (decision risk analysis strategies)	[Instructor Case Study] [Class Project 3hrs]
M	9	Analysis and evaluation of M&S (assigning risk)	[Instructor Case Study] Class Project 3hrs]
M	10	Analysis and evaluation of M&S (trade studies and related MOPS)	[Instructor Case Study] [Class Project 3hrs]
M	11	Analysis and evaluation of M&S (assessment tools and MOES)	[Instructor Case Study] [Class Project 3hrs]
M	12	Portfolio Assessment and Final Exam	Presentations, class evaluation and grading criteria

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General Awareness Skill Level by hour of instruction:

Module 1(G) Course Overview and Introductions:

- 1 Instructor Introduction and program overview
- 2 Overview of the course objectives
- 3 Introduction to the risk analysis process
- 4 Selection of team projects and instructor expectations of project deliverables
Ref: A7.1-A7.5 P6.6 Ref: [1], [2], instructor notes.

Understanding Skill Level by hour of instruction:

Module 2(U) Identify & define risk analysis/mitigation process

- 5 Risk Mitigation Methodology and the VV&A process
Ref: A7.1 Ref: [1], [2], instructor notes.
- 6 M&S Credibility and SW accuracy
Ref: A7.2, A7.3 Ref: [1], [2], instructor notes.
- 7 Data Accuracy and M&S accreditation.
Ref: A7.4, P6.6 Ref: [1], [2], instructor notes.
- 8 Student Team Project Workshop

Module 3(U) understanding risk and its relationship to the VV&A process

- 9 M&S output accuracy, usability and capability
Ref: A7.1 Ref: [1], [2], instructor notes.
- 10 Accreditation and executing the VV&A plan
Ref: A7.2, A7.3 Ref: [1], [2], instructor notes.
- 11 New and Legacy models with associated case studies.
Ref: A7.4, P6.6 Ref: [1], [2], instructor notes.
- 12 Student Team Project Workshop

Application Skill Level by hour of instruction:

Module 4(A) Understanding details of the M&S accreditation process

- 13 Introduction to Accreditation case study
Ref: A7.1 Ref: [1], [2], instructor notes.
- 14 Steps in the accreditation decision process
Ref: A7.2, A7.3 Ref: [1], [2], instructor notes.
- 15 How to make a case for M&S accreditation
Ref: A7.4, P6.6 Ref: [1], [2], instructor notes.
- 16 Student Team Project Workshop

Module 5(A) Identification and application of M&S accreditation process

- 17 DOD Policy, examples and case study
Ref: A7.1 Ref: [1], [2], instructor notes.
- 18 Case study and class project related to the accreditation process
Ref: A7.2, A7.3 Ref: [1], [2], instructor notes.
- 19 Use of M&S tools in support of identification and prioritization of risk factors using a Decision Risk Analysis process. Identify critical elements required to develop exceptional system risk mitigation strategies.
Ref: A7.4, P6.6 Ref: [1], [2], instructor notes.
- 20 Student Team Project Workshop

Module 6(A) Understanding risk associated with software development

- 21 Software capability and design risk considerations
Ref: A7.1 Ref: [1], [2], instructor notes.
- 22 Software accuracy risk considerations
Ref: A7.2, A7.3 Ref: [1], [2], instructor notes.
- 23 Software configuration management required to monitor and track risk
Ref: A7.4, P6.6 Ref: [1], [2], instructor notes.
- 24 Student Team Project Workshop

Module 7(A) Class Project Presentations and Mid Term Exam

- 25 Mid Term Exam to evaluate student competency at the application level.
Ref: A7.1-A7.5 P6.6 Ref: [1], [2], instructor notes
- 26 In-class mid term answers, review and student self grading
- 27-28 Class team project: Student to show how they would perform informed engineering tradeoff analyses through a Decision Risk Analysis process. Student

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will show how they would apply modeling and simulation techniques to risk analysis and risk mitigation.

Ref: A7.1-A7.5 P6.6 Ref: [1], [2], instructor notes

Mastery Skill Level by hour of instruction:

Module 8(M) Analysis and evaluation intended use statement, MOP's and MOE's
29 Instructor case study on the on intended use statement, MOP's and MOE's
30 Student perform in-class project based on the case study and class instructions
31 Student perform in-class project based on the case study and class instructions
32 Instructor evaluation of class project progress

Module 9(M) Risk assessment and quantifying risk
33 Instructor case study on the quantifying of risk mitigation strategies
34 Student perform in-class project based on the case study and class instructions
35 Student perform in-class project based on the case study and class instructions
36 Instructor evaluation of class project progress

Module 10(M)
37 Instructor case study on the analysis and evaluation of decision risk trade studies and related MOP's
38 Student perform in-class project based on the case study and class instructions
39 Student perform in-class project based on the case study and class instructions
40 Instructor evaluation of class project progress

Module 11(M) Analysis and evaluation of M&S (how to assess tools and MOE's)
41 Instructor Case Study on the analysis and evaluation of decision risk tools and MOE's
42 Student perform in-class project based on the case study and class instructions
43 Student perform in-class project based on the case study and class instructions
44 Instructor evaluation of class project progress
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Module 12(M) Portfolio Assessment and Final Exam
45 Student final exam and instructor initiate review and in-class grading
46 Complete in-class self grading
47 Initiate student presentations and student portfolio assessment.
48 Complete student portfolio assessment and instructor provide final assessments