

Syllabus ISE 639

1) Course name

ISE 639 M&S Data Strategies

2) Course coordinator

Dr. Mikel D. Petty, 256-824-4368, pettym@uah.edu

3) Course description

Categories, uses, formats, and models of data for modeling and simulation. Acquiring, converting, preparing, controlling, securing, and distributing data. Focus is on their application and suitability for testing and acquisition applications.

4) Modules incorporated into course

P15-G Data strategy (General awareness)

P15-U Data strategy (Understanding)

P15-A Data strategy (Application)

P15-M Data strategy (Mastery)

plus portions of P10 M&S in the acquisition process

5) ESRs that the course supports and the corresponding level of mastery

ESR P15 General awareness, Understanding, Application, and Mastery

6) Prerequisites assumed, and corresponding level of mastery

Basic familiarity with M&S concepts, equivalent to MSIAC M&S Staff Officers Course

7) Course maturity

Not previously taught as a course; much of the material has been taught in other courses, particularly Old Dominion University's MSIM 601 course and in Certified Modeling and Simulation Professional examination preparation courses.

8) Number of contact hours and pace contemplated

Semester course: 3 lecture hours per week for 16 weeks

9) Proposed delivery modality

Face-to-face lecture, synchronous distance learning (live audio/video connection), asynchronous distance learning (web or CD)

10) Proposed references and texts

[1] S. Adelman, L. Moss, and M. Abai, *Data Strategy*, Addison-Wesley, 2005.

[2] B. P. Zeigler and P. E. Hammonds, *Modeling and Simulation-Based Data Engineering: Introducing Pragmatics into Ontologies for Net-Centric Information Exchange*, Academic Press, 2007.

11) Course learning objectives

Correspond to sub-ESRs for ESR P14

- a) P15.1 List the categories of data sets required (such as terrain databases, Ph/Pk tables, and sensor performance parameters) for typical model and simulation types.
- b) P15.2 List the data requirements for typical test and acquisition M&S applications in terms of data sets, data volume, data availability, data accuracy, data classification, data storage media, and data archival.
- c) P15.3 Identify existing data resources available for reuse, including both unauthenticated (for simulation testing) and authenticated (for actual test use) data, and describe the procedures for searching for resources within repositories of them.
- d) P15.4 Define commonly used formats for documenting data (i.e., meta-data) and describe how to use each form to assess a data set's utility for a specific application.
- e) P15.5 For each type of data used by models and simulations, define commonly used formats for structuring and encoding the data (e.g., XML for entity performance parameters or CTDB for terrain) and describe how the format supports correct and appropriate use and reuse of data sets so structured.
- f) P15.6 Define concepts of data models (e.g., HLA object models), identify commonly used data models (e.g., HLA RPR FOM), and explain how data models relate to data sets.
- g) P15.7 Specify proper security procedures for safeguarding classified data sets, both input and output, during and between simulation executions.
- h) P15.8 Prepare for distribution of output data sets produced by simulation executions, including documenting data format, assumptions, accuracy, and applicability.
- i) P15.9 Describe approaches, identify tools, and estimate resources required for converting data sets from one format to another (e.g., converting terrain data from DTED to OneSAF OTF) if needed for a particular M&S application.
- j) P15.10 Estimate the effort required to acquire and create the data needed for a test or acquisition M&S application, based on data required for the simulation, existing data resources available, and data creation experiences.
- k) P15.11 Describe case studies of successful data acquisition and creation for data-intensive applications of commonly used models, data sets, and simulations, and the characteristics of those applications that made the reuse successful.

12) **Course assessment plan**

1. Mid-term and final exams
2. Short-answer homework assignments, ~1 per week
3. Student special topic presentations, ~30 minutes, 2 per student per semester.

13) **Topic list by hour of instruction and reference**

Listed for each hour are topic description, related sub-ESR, and reference (if any).

1. Identify the phases of the acquisition life cycle; P10.1; to be determined
2. Identify the principal M&S applications used in each of the phases of the acquisition life cycle; P10.2; to be determined
3. Describe representative examples of M&S used for each type of application in each phase of the acquisition life cycle; P10.3; to be determined
4. List the inputs, outputs, capabilities, and limitations of each example M&S; P10.4; to be determined

5. Basic concepts, definitions, and examples of data set categories (e.g., terrain databases, Ph/Pk tables, and sensor performance parameters) required for typical model and simulation types; P15.1; to be determined
6. Basic concepts, definitions, and examples of data requirements for typical test and acquisition M&S applications; P15.2; to be determined
7. Basic concepts, definitions, and examples of each type of existing data resource; P15.3; to be determined
8. Basic concepts, definitions, and examples of data documentation formats; P15.4; [1] [2]
9. Basic concepts, definitions, and examples of data encoding formats; P15.5; [1] [2]
10. Basic concepts, definitions, and examples of data models; P15.6; [1] [2]
11. Basic concepts, definitions, and examples of data security procedures; P15.7; [1] [2]
12. Basic concepts, definitions, and examples of simulation data distribution; P15.8; [2]
13. Basic concepts, definitions, and examples of data conversion; P15.9; [1] [2]
14. Basic concepts, definitions, and examples of data acquisition and creation effort; P15.10; to be determined
15. Simple case studies of successful data acquisition and creation in test and acquisition M&S applications; P15.11; to be determined
16. Technical details of simulation data sets, including representation, resolution, fidelity, and size, for typical model and simulation types; P15.1; [2]
17. Technical details and normal value ranges of data requirement parameters (e.g., data sets, data volume, data availability, data accuracy, data classification, data storage media, data archival; P15.2; [2]
18. Lists and details of existing data repositories; P15.3; to be determined
19. Technical details and advanced examples of data documentation formats; P15.4; [1] [2]
20. Technical details and advanced examples of data encoding formats; P15.5; [1] [2]
21. Technical details and advanced examples of data models; P15.6; [1] [2]
22. Relationship of data models to data sets; P15.6; [1] [2]
23. Data security requirements and procedures; P15.7; to be determined
24. Advanced examples of data security in test and acquisition M&S applications; P15.7; to be determined
25. Advanced examples of data distribution in test and acquisition M&S applications; P15.8; to be determined
26. Advanced examples of data conversion for test and acquisition M&S applications; P15.9; to be determined
27. Available data conversion tools and utilities; P15.9; to be determined
28. Advanced examples of data acquisition and creation effort in test and acquisition M&S applications; P15.10; to be determined
29. Advanced case studies of both successful and unsuccessful data acquisition and creation in test and acquisition M&S applications; P15.11; to be determined
30. Determining data set categories for typical model and simulation types; P15.1; [2]
31. Determining data requirements for typical test and acquisition M&S applications; P15.2; [2]
32. Procedures for examining, acquiring, customizing, and reusing existing data resources; P15.3; to be determined

33. Using data documentation in each format to evaluate data utility; P15.4; [1] [2]
34. Using data encoding formats to encode or decode simulation data; P15.5; [1] [2]
35. Using data models to structure and organize data within a test and acquisition M&S application; P15.6; [1] [2]
36. Instituting and executing data security in test and acquisition M&S applications; P15.7; to be determined
37. Performing data distribution in test and acquisition M&S applications; P15.8; to be determined
38. Performing data conversion for test and acquisition M&S applications; P15.9; to be determined
39. Effects of data conversion on data resolution and accuracy; P15.9; to be determined
40. Estimating effort required for data acquisition and creation in test and acquisition M&S applications; P15.10; to be determined
41. Adapting methods and lessons regarding data acquisition and creation from a case study to a new test and acquisition M&S application; P15.11; to be determined
42. Analyzing a test and acquisition M&S application for lessons learned regarding data acquisition and creation; P15.11; to be determined
43. Selecting among data acquisition and creation alternatives; P15.10; [1] [2]
44. Selecting a case study relevant to data acquisition and creation in a planned test and acquisition M&S application and extracting pertinent lessons learned; P15.11; to be determined