Course Number: E M 595 (new catalog # will be E M 569)
Course Name: System Architecting
Instructor: Alice Squires      email: alice.squires@wsu.edu
Semester Credits: 3      Prerequisites: E M 565 or instructor permission

Course Description and Objectives:
A fundamental understanding of systems architecting is essential for today’s technological leaders to manage and lead complex interconnected sociotechnical system designs such as computer and information systems, command and control systems, space systems, transportation systems, agricultural systems, and health management systems, to name a few. System Architecting addresses the role of systems architecture and the systems architect, the system architecting process, and practical heuristics for developing robust, flexible system architectures. The course focuses inside the system solution boundary to develop operational, logical (functional), and physical architectures meeting defined system requirements that address customer needs and ultimately provide an optimal system design that addresses a well-defined problem or opportunity. Students will apply architectural principles and practices to the development of a system architecture that will provide insight to the linkages between stakeholder requirements and their translation to system requirements, early architectural decisions, and system deployment, operation and sustainment phases, and associated development, operation and support costs. Instructional methods will consist of lectures with interactive student participation, video presentations, guided online discussions, homework problems/review with quizzes, student team presentations, and a final individual project.

After taking this course, the student will be able to:
- Describe the role of system architecture and the system architect within the system development process.
- Describe practical heuristics for developing system architectures.
- Compare and contrast form, fit, and function in the context of system architecture.
- Explain and apply the process of moving from system concept to system architecture.
- Describe ‘good’ and ‘bad’ architectures.
- Explain the roles of systems thinking and decision-making in system architecture development.
- Compare and contrast architectural frameworks (such as DoDAF, FEAF, Zachman, and TOGAF) used in government and industry and apply at least one framework to communicate architecture descriptions.
- Perform system level modeling of a system architecture.
- Use a systems engineering based tool to support the development and linkage of systems engineering requirements, system architecture elements, and system modeling processes.
- Assess system architecture alternatives and recommend an optimal system architecture solution.
- Formulate and solve a system architecture optimization problem.
- Use an iterative architecture development process to construct consistent operational, logical (functional), and physical system architectures that address a well-defined problem or opportunity, applying the methods learned in the course.

Course Topics:
- Thinking about Systems
  - Systems Architecture Introduction
  - Systems Thinking
  - Thinking about Complex Systems
  - Ethics and Architecture
- Architectural Analysis
  - Form, Fit, Function
  - System Architecture
  - Architecture Frameworks
  - Solution Neutral Function and Concepts
  - From Concept to Architecture
- Creating the Architecture
  - The Role of the Architect
  - Upstream / Downstream Influences
  - Translating Needs into Goals
  - Applying Creativity to Generate Concepts
  - Decomposition for Managing Complexity
- Architecture as Decisions
  - Architecture as a Decision-Making Process
  - Architectural Trade-space Reasoning
  - Formulating and Solving System Architecture Optimization Problems

Grading:
Participation: 15%, Discussion: 15%, HW Quizzes: 30%, Team project: 10%, Final Project: 30%