MARTHA BRADLEY EVANS
Center for Teaching Excellence
THE UNIVERSITY OF UTAH

SIME 5960/6960 Systems Architecting
Spring Semester 2025

Course Description
Systems Architecting is how we set the purpose of a system, create its conceptual structure, select the development approach, and validate it for use. System Architecting works through stakeholder interaction and conceptual design to determine and trade the primary sources of value, cost, and risk. The course presents best practices for systems architecting through case studies of major system developments (successful or otherwise) and a set of methods to make and describe architecture decisions. Students will learn key architecture heuristics, adapt core systems engineering tools for architecture decision making, and apply both informal and formal description notations.

Course Outcomes and Objectives
By the end of this course you should be able to:

1. Identify where architectural decisions occur in typical program scenarios, including Government sponsored contracted developments, incremental commercial developments, major product cycles, and entrepreneurial product developments.
2. Distinguish architectural and non-architectural design decisions
3. Describe the elements of an architecture description document, and distinguish descriptive from decision elements
4. Define model-based approaches to constructing architectural views
5. Identify and apply domain-specific heuristics in areas such as builder-architected, collaborative, opposed, and software-centric systems.
6. Demonstrate the application of heuristic and analytical methods to key architectural phases
    a. Purpose analysis, including user-facing versus builder facing requirements
    b. Problem structuring, including objective trees and functional versus non-functional objectives
    c. Solution structuring, including brainstorming techniques and layered models
    d. Consistency and completeness analysis, at stakeholder and model levels
    e. Concept selection methods
7. Demonstrate application within a domain of realistic scale and complexity

Course Requirements

The course is case and discussion oriented, and students will be evaluated through their ability to analyze complex application cases and creatively apply methods to cases of interest. 40% of the grade will be based on incremental completion of a series of set case examples, implemented as discrete homework assignments. For 40% students will select an application area of personal interest and prepare an architectural analysis of that area using the methods in class. This may be taken from a real problem or represent a system concept the student wishes to explore. This must be presented

incrementally to the instructor, in-person or via Zoom. There will be an open-book final exam for the last 20% of the grade.

Class Element	Grade Percentage
Homework assignments on case examples	40%
Group case exercise	40%
Final Exam	20%

Grading Scale

Grading Scale: A: 100-94%, A- 93.9-90%, B+: 89.9-87%, B: 86.9-83%, B-: 82.9-80%, C+: 79.9-77%, C: 76.9-73%, C-: 72-70%, D: 69%-60%, E: <60%

University Policies

Updated mandatory syllabus policies regarding the ADA Act, Safety at the U, Addressing Sexual Misconduct, and Academic Misconduct can be viewed at: https://cte.utah.edu/instructor-education/syllabus/institutional-policies.php and are included at the end of this syllabus.

Preliminary Course Schedule

Week	Concepts and Cases	Assignments	Readings
1	Systems architecting within the lifecycle, Grand Challenge	Grand Challenge exercise	Maier Ch 1, 2 NOVA Grand Challenge video
2	APM-ASAM Introduction, Purpose Analysis	Case exercise: Purpose Analysis	Maier Ch 8, 9, supplement A
3	GPS Case study, Collaborative systems, Problem Structuring	Case exercise: Problem Structuring	Maier Ch 4, Supplement B, optional movie
4	Solution Structuring	Case exercise: Solution structuring	Supplement C
5	De-Stovepiping and IT, Harmonization	Case exercise: Harmonization	Maier Ch 6 plus case, Supplement D
6	Program Templates, Selection	Case exercise delivery preparation	Maier Ch 12-13, Supplement E
7	Project 1 Reviews, Intelligent Transport and Social Systems	Case Exercise #1 full Delivery, Case exercise #2 proposals	Maier Ch 5
8	Break Week		
9	Project selection teaming, integrated review, Charrettes	Case exercise #1 revisions, Case exercise #2 proposal revisions	Supplement F

10	Builder architecting, technology driven systems, application discussion	Orientation delivery, Charrette plan	Maier Ch 3 and case study DC-3
11	Charrette sessions, PrOACT/DA, Value Focused Thinking	Conduct charrette, personal VFT exercise	Library materials
12	Opposed systems and economic impact, ISO standards concepts	Heuristics identification and selection	Supplement G ISO/IEC 42010 and 42020
13	Uncertainty and Architectures Architecture notations and tools	Uncertainty identification and strategy selection	Maier Ch. 12, McKinsey papers
14	Architecture model-centric methods	Case exercise #2 initial delivery	MBSE Intro
15	Layered Modeling, beyond technical challenges		Maier Ch 12
16	Review, Project presentations	Case exercise #2 full delivery	
	Final Exam Week		

Course Prerequisites:
ME EN 2550, CS3130, ECE3530, MATH 3070, BME 3070, MET E 3070, or OSC 2030

University of Utah Institutional Policies

Americans With Disabilities Act (ADA)

The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities.

All written information in this course can be made available in an alternative format with prior notification to the Center for Disability & Access (CDA). CDA will work with you and the instructor to make arrangements for accommodations. Prior notice is appreciated. To read the full accommodations policy for the University of Utah, please see Section Q of the Instruction & Evaluation regulations.

In compliance with ADA requirements, some students may need to record course content. Any recordings of course content are for personal use only, should not be shared, and should never be made publicly available. In addition, recordings must be destroyed at the conclusion of the course.

If you will need accommodations in this class, or for more information about what support they provide, contact:

Center for Disability & Access

801-581-5020
disability.utah.edu
65 Student Services Building
201 S 1460 E
Salt Lake City, UT 84112

Safety at the U

The University of Utah values the safety of all campus community members. You will receive important emergency alerts and safety messages regarding campus safety via text message. For more safety information and to view available training resources, including helpful videos, visit safeu.utah.edu.

To report suspicious activity or to request a courtesy escort, contact:

Campus Police & Department of Public Safety

801-585-COPS (801-585-2677)
dps.utah.edu
1735 E. S. Campus Dr.
Salt Lake City, UT 84112

Addressing Sexual Misconduct

Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status, or genetic information.

If you or someone you know has been harassed or assaulted, you are encouraged to report it to university officials:

Title IX Coordinator & Office of Equal Opportunity and Affirmative Action

801-581-8365
oeo.utah.edu
135 Park Building
201 Presidents' Cir.
Salt Lake City, UT 84112

Office of the Dean of Students

801-581-7066
deanofstudents.utah.edu
270 Union Building
200 S. Central Campus Dr.
Salt Lake City, UT 84112

To file a police report, contact:

Campus Police & Department of Public Safety

801-585-COPS (801-585-2677)
dps.utah.edu
1735 E. S. Campus Dr.
Salt Lake City, UT 84112

If you do not feel comfortable reporting to authorities, the U's Victim-Survivor Advocates provide free, confidential, and trauma-informed support services to students, faculty, and staff who have experienced interpersonal violence.

To privately explore options and resources available to you with an advocate, contact:

Center for Campus Wellness

801-581-7776
wellness.utah.edu
350 Student Services Building
201 S. 1460 E.
Salt Lake City, UT 84112

Academic Misconduct

It is expected that students comply with University of Utah policies regarding academic honesty, including but not limited to refraining from cheating, plagiarizing, misrepresenting one's work, and/or inappropriately collaborating. This includes the use of generative artificial intelligence (AI) tools without citation, documentation, or authorization. Students are expected to adhere to the prescribed professional and ethical standards of the profession/discipline for which they are preparing. Any student who engages in academic dishonesty or who violates the professional and ethical standards for their profession/discipline may be subject to academic sanctions as per the University of Utah's Student Code: Policy 6-410: Student Academic Performance, Academic Conduct, and Professional and Ethical Conduct.

Plagiarism and cheating are serious offenses and may be punished by failure on an individual assignment, and/or failure in the course. Academic misconduct, according to the University of Utah Student Code:

"...Includes, but is not limited to, cheating, misrepresenting one's work, inappropriately collaborating, plagiarism, and fabrication or falsification of information…It also

includes facilitating academic misconduct by intentionally helping or attempting to help another to commit an act of academic misconduct."

For details on plagiarism and other important course conduct issues, see the U's Code of Student Rights and Responsibilities.

Last updated May 2024.