Syllabus for ASE 6102
Systems Architecting and Complex Systems
Fall 2026

Instructor: Jean Charles Domerçant, PhD
Mentors: Mike Maldonado, John DeHart

Course Description:

This course will introduce fundamental concepts of systems architecting as a critical part of system engineering and development. Students will learn classic methods and advanced topics associated with systems architecting and extend those concepts to complex systems.

Pre- and/or Co-Requisites:

ASE 6001 – ASE 6006: This class will rely heavily on the concepts and knowledge gained from previous classes, particularly the classes that focus on SysML and various modeling and simulation techniques. Students will be expected to use these skills in building their solution architecture. Students should be prepared to review the relevant material from previous classes in addition to the lectures and reference materials for this class.

Office Hours:

Wednesdays, 7pm-8:00pm

Time	Topic
7pm – 7:30 p.m.	Announcements, Schedule Review, and Upcoming Deliverables, Student Q&A
7:30 pm – 8:00 p.m.	Architecture Lab Review & Relevant Topic Discussion

Course Goals

- Define the systems architecting activity in terms of the Architecting Process Model
- Explain how systems architecting differs from but also relates to engineering and design
- Explain the role of the systems architect
- Analyze stakeholder needs and translate those needs into requirements and derived requirements
- Classify systems according to various definitions that include classical systems, Systems of Systems, Family of Systems, Enterprise Systems, etc.
- Identify sources of complexity and their impact on system behavior and design
- Evaluate a system architecture in the context of meeting stakeholder needs
- Create an architecture representation, or set of abstracted designs of the system, based on well-formed models using a Model-Based Systems Engineering approach
- Formulate a modeling and simulation approach to support system analysis as part of the overall architecture

Grading Policies

Grading breakdown:

Grading Type	Description of Graded Assignments	% Grade	Length of Time
Homework: Architecting Lab Assignments	Students will individually complete assignments to apply the architecting principles and methods presented in the class. During each office hour, a portion of time will be set aside to conduct an Architecture Lab, which will facilitate a more in-depth discussion of the previous week's topics and demonstrate application towards an example problem. The example problem will provide a case study of sufficient detail and complexity to meet the learning objectives and facilitate more in-depth discussion.	40	Students will submit architecting pre-lab assignments prior to each scheduled office hour. Each pre-lab assignment should take approximately 2 - 4 hours to complete. There will be a total of 4 homework pre-lab assignments. It is recommended that students start on assignments well in advance to allow sufficient time to complete and ask clarifying questions ahead of the submission deadline.
Module Quizzes	Each student must individually answer questions associated with a given module to assess the level of reading comprehension. Quizzes are directly related to the reading assignments and module lectures. See the class schedule for exact due date and time.	14	Quizzes will not be timed, but on average should take less than 10 minutes to complete. There will be a total of 7 module quizzes.
Capstone Project Sponsor Interview Questionnaire	Each Capstone Project Team will provide answers to a questionnaire after conducting the first interview with the project sponsor.	4	The questionnaire consists of approximately 8 questions and on average, should take 1 hour or less to complete.
Midterm Presentation & Peer Review (Capstone Project)	Group presentation during the Midterm Live Session on Capstone Project background and formulation; Points will be awarded based on the quality of the group submission as well as individual participation and contributions to the group assignment; If an individual fails to significantly contribute an individual grade made be awarded. Each Capstone project team will also be assigned to peer review another team using the peer review form.	12	The Capstone project will span the entire 7 weeks, and students will work simultaneously in organized teams. Each Capstone team will be responsible for conducting regular meetings with the project sponsor and stakeholder as well as internal team meetings.
Final	Group presentation during Final Live Session and submission of Capstone Project document sections and architecture artifacts. Points will be awarded based on the quality of the group submission as well as individual participation and contributions to the group assignment; If an individual fails to significantly contribute an individual grade may be awarded.	30	

	Project groups must also submit modeling artifacts for evaluation. Groups will also submit an initial draft of selected sections of the Capstone Final Report.		

Capstone Project (Weeks 1-7):

- The Capstone project runs the entire length of the class.
- Students will be organized into teams early on and assigned a Capstone topic.
- Students will be expected to hold internal team meetings as well as scheduled meetings with the project sponsors and stakeholders.
- As the course progresses, students will be expected to apply the knowledge and skills developed during the live architecting lab sessions to the Capstone project, executing the Architecting Process Model.
- A live Capstone project midterm status review session will take place during Week 4.
- The class will conclude with a special Live Session at the end of Week 7 where students will present their problem formulation and architecture description.
- Students will conduct an individual peer review during the Week 7 live session, critiquing the presentation of another Capstone team.

Late Submissions

- Late quizzes will not be accepted.
- Late homework and project assignments will be subject to a 5-point deduction each 4 hours the assignment is late. Late homework and project assignments will not be accepted after 24 hours without prior approval from the instructor outside of family/medical emergencies.

Attendance Policy

- This is a fully online course.
- Login on a regular basis to complete your work, so that you do not have to spend a lot of time reviewing and refreshing yourself regarding the content.

Plagiarism Policy

Plagiarism is considered a serious offense. You are not allowed to copy and paste or submit materials created or published by others, as if you created the materials. All materials submitted and posted must be your own.

Student Honor Code:

Students are reminded of the Georgia Tech Honor Code. Please see http://www.honor.gatech.edu. Any act of dishonesty will result in a Fail Grade.

Students with Disabilities:

Georgia Tech offers accommodations to students with disabilities. If you need a classroom accommodation, please make an appointment with the *ADAPTS* office (http://www.adapts.gatech.edu).

Communication

- Email communication with instructor is recommended for any questions or concerns.
- Please communicate clearly with your teammates.

Netiquette

- Netiquette refers to etiquette that is used when communicating on the Internet. When you are communicating via email, discussion forums or synchronously (in real-time), please use correct spelling, punctuation, and grammar consistent with the academic environment and scholarship.
- We expect all participants to interact respectfully. Learners who do not adhere to this guideline may be removed from the course.

Class Text:

1. Maier, M. W. (2009). *The art of systems architecting*. CRC press.
2. Mo Jamshidi (Ed.), "Systems of Systems Engineering: Principles and Applications", CRC Press, 2009.

References:

1. Research and Engineering, Office of the Under Secretary of Defense. (2022). *Systems engineering guidebook*. Department of Defense. *Washington, DC: Pentagon*. https://ac.cto.mil/wp-content/uploads/2022/02/Systems-Eng-Guidebook_Feb2022-Cleared-slp.pdf
2. Lightsey, B. (2001). *Systems engineering fundamentals*. DEFENSE ACQUISITION UNIV FT BELVOIR VA. https://apps.dtic.mil/sti/citations/ADA387507
3. Acquisition Technology & Logistics, Office of the Under Secretary of Defense. (2008). Systems engineering guide for systems of systems. Department of Defense. *Washington, DC: Pentagon*.
4. Maier, M. W. (1998). Architecting principles for systems-of-systems. *Systems Engineering: The Journal of the International Council on Systems Engineering*, *1*(4), 267-284.
5. Hilliard, R. (2000). IEEE-STD-1471-2000 recommended practice for architectural description of software-intensive systems. *IEEE, http://standards. IEEE. org*, *12*(16-20), 2000.
6. Maier, M. W., Emery, D., & Hilliard, R. (2004). IEEE 1471 and systems engineering. *Syst. Eng*, *7*(3).
7. Rouse, W. B. (2008). Health care as a complex adaptive system: implications for design and management. *Bridge-Washington-National Academy of Engineering-*, *38*(1), 17.
8. Sheard, S. A., & Mostashari, A. (2009). Principles of complex systems for systems engineering. *Systems Engineering*, *12*(4), 295-311.
9. Sheard, S. A., & Mostashari, A. (2010, July). 7.3. 1 A complexity typology for systems engineering. In *INCOSE International Symposium* (Vol. 20, No. 1, pp. 933-945).
10. Kazman, R., Klein, M., Barbacci, M., Longstaff, T., Lipson, H., & Carriere, J. (1998, August). The architecture tradeoff analysis method. In *Proceedings. fourth ieee international conference on engineering of complex computer systems (cat. no. 98ex193)* (pp. 68-78). IEEE.
11. Sage, A. P., & Biemer, S. M. (2007). Processes for system family architecting, design, and integration. *IEEE Systems Journal*, *1*(1), 5-16.
12. Flumerfelt, S., Schwartz, K. G., Mavris, D., & Briceno, S. (Eds.). (2019). *Complex systems engineering: Theory and practice*. American Institute of Aeronautics and Astronautics, Inc..
13. DoD, U. S. (2011). System Engineering fundamentals Defense Acquisition University Press. Fort Belvoir (VA): downloaded on, 7, 2001-01.

Technology/Software Requirements

- Internet connection (DSL, LAN, or cable connection desirable)