

EGRMGMT 590 Advanced Topics in Engineering Management: Software, Solution, and Enterprise Architecture

Course Syllabus

Spring 2023 Class Schedule: Wednesdays 7:00pm-9:45 pm in Teer 106

Listed as EGRMGMT 590.01 (6330) in Duke Hub

Instructor	Contact Information & Office Hours
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Course Overview:

Modern organizations, whether for profit, not for profit, or educational, rely on a coherent, organized, well maintained set of software systems to support their operational effectiveness and achieve their business goals. The foundational aspect of an optimal software system is its architecture. Architecture is the blueprint for a software system or system of systems. Proper architecture requires a well-defined and constantly honed set of skills at different levels of abstraction in the architecture continuum.

This course will prepare students to understand the different types of architecture in the software world, the figure and role of the architect, the basics of architecture patterns, cloud computing, data management, data integration, and architecture governance. This course will focus a significant effort on the architect's responsibility to be the bridge between business operations and IT, namely the architect's role in the effective documentation of proper architecture and its evangelization in light of the different needs of different stakeholders. The course includes the requirement to complete an architecture project inspired by and as close to a real life scenario as the time constraints allows.

Class Structure:

Each class module lasts 2 hours and 45 minutes with a 15 min break. The class module includes a lecture, in class exercises, simulations or group discussions depending on the content of each module.

Class Participation and attendance:

Participation will be based on both frequency and quality. Frequency is important so that the class can benefit from your own unique experience. Quality is important for comments that are directly relevant and will help advance the class' thinking on a topic. It is critical that you make your thinking clear to the class. With clarity the class can productively debate your logic and reasoning. In many real life scenarios architectural outcomes and decisions represent a "best of all", rather than the "correct" answer; the clarity of the student's thought process is often more important than the final result. Finally, spontaneity in a discussion is important. You should come to class well prepared with all the readings as well as be prepared to change your thinking based on how the class proceeds.

Class attendance is MANDATORY. Distance learning students need to notify professor that they reviewed the lectures no later than 2 days after class. If you miss more than 2 classes, your attendance grade will be a B. If you miss more than 4 classes, your attendance grade will be a C.

Pop Quiz:

These are multiple choice quizzes given 2-3 times during the semester. Each quiz will be based on a real-life scenario and have 4 possible answers. Along the TOGAF model, points will be awarded for 3 of the 4 answers: 5 points for the best answer, 3 points for the second best, 1 point for the third best. Quizzes will cover the last 3 or 4 modules discussed in class.

In Class/At Home Exercises:

- Exercises are tasks that must be done to make sure there is clear understanding of a concept just discussed in class.
- Exercises are assigned at some point during a class and are expected to be completed by teams.
- All teams are expected to submit their assignment via Sakai drop box and present their results during class.
- The grading breakdown for these assignments is:
 - Oral presentation 50%
 - Written submission 50%

Course Project:

Teams will be assigned a project that they must complete during the semester. This project will prepare the students to create a fully documented solution architecture that satisfies the scenario provided.

Students will be assigned to 2-3 people teams to work on preparing a Solution Architecture for a real-life scenario. The project may be conducted in conjunction with a group of professionals from a commercial organization selected by the professor. The project must be worked on weekly basis during the semester and must be completed and presented during the last week of class. All lectures throughout the semester include concepts that need to be applied for this project.

Each week the students will have a chance to ask questions or clarifications about the project. Two formal checkpoints to review progress will take place during the class, as indicated in the schedule. During the final project presentation, the team presenting the project will be evaluated by their peers in class including external professionals and the professor. The duration of the final project presentation will be determined during the class based on the number of students in the class and the number of teams. Standard evaluation sheets will be provided. The project evaluators will play the role of the high-level management within the company.

This project will prepare the students to execute the architecture process by allowing them to make decisions, recommend solutions, and apply the architecture concepts learned in class. A separate project hand out will be given at the beginning of class.

The overall course project grade breakdown is:

- Final Oral Presentation: 50%
- Final Written Report: 50%

Grading:

10 %	<i>Class participation (attendance & participation)</i>
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15 %	3 Flash Quizzes
25 %	In Class/At home exercises (Team)
50 %	Course project (Team)

Grading Scale:

A+	97-200		C+	77-79
A	93-96		C	73-76
A-	90-92		C-	70-72
B+	87-89		D	60-69
B	83-86		F	<60
B-	80-82			

Course Pack & Textbook:

- The course pack has the case studies and articles to be assigned.

Articles:

Review articles are to be read by each student individually. Review articles are necessary to complement what will be taught in the lectures. Reading them counts towards your class participation grade in the event a question is asked from the material read. Most articles are listed in the syllabus, but the professor may assign different review articles at beginning of each class.

Recommended Reading Books:

- Software Architect's Handbook – Joseph Ingeno, 2018 –
<https://www.packtpub.com/product/software-architect-s-handbook/9781788624060>

Duke Permalink: <https://go.oreilly.com/duke-university/library/view/~/9781788624060/?ar>

- Enterprise Architecture As Strategy: Creating a Foundation for Business Execution by Jeanne W. Ross, Peter Weill, David Robertson - 2006

Team Assignments:

Students will be assigned to teams and will not get to choose who their team members are. This is to reflect the just “real world” project team experience. We will do our best to make sure that each team is composed of a mix of personal / cultural backgrounds, undergraduate degrees, and experiences as reflective of the marketplace. Each team must have a at least one native English speaker.

Sakai:

- All course materials (lectures, case solutions, project guidelines, and others) will be posted on Sakai in the “Resources” tab a day before the class takes place.

- Students place their submissions individual or team submissions in Dropbox. For team submissions, students submit in their respective team folder.

Academic Integrity:

Students are expected to abide by the Duke University Community Standard with respect to the honor pledge in completion of homework, project and tests. Specifically make sure you are also familiar with the Duke definition of academic dishonesty. Duke Community Standard:

- I will not lie, cheat, or steal in my academic endeavors.
- I will conduct myself honorably in all my endeavors.
- I will act if the Standard is compromised.

Zoom Room:

Office hours: by appointment ➔ <https://duke.zoom.us/j/8494231617>

Lectures: Wednesdays 7 PM ➔ In person unless restrictions are put in place by the University's administration and/or government authorities.

Group Chat:

Students will be added to a Whatsapp group chat

Class Schedule:

Week	Date	Topic	Reading
1	1/18	<ul style="list-style-type: none"> • Introduction to Software Architecture • Understand software stakeholders. • Architect role within the organization • Software, Solution & Enterprise Architecture comparisons 	Book extract https://www.leanix.net/en/download/comparing-it-architecture-roles https://www.leanix.net/en/download/the-enterprise-architect-of-tomorrow
2	1/25	<ul style="list-style-type: none"> • Software architecture design • Class Project Kick-off 	Book extract
3	2/1	Software Architecture Patterns	Book extract
4	2/8	Monolith, SOA, Microservices, or Serverless Architecture	https://rubygarage.org/blog/monolith-soa-microservices-serverless https://12factor.net/ Book extract
5	2/15	Data Management Basics	https://www.dataversity.net/what-is-data-management/# https://computingeducation.de/pub/2017_Grillenberger-Romeike_Koli2017.pdf
6	2/22	Cloud Computing Basics	https://us-cert.cisa.gov/sites/default/files/publications/CloudComputingHuthCebula.pdf https://www.guru99.com/cloud-computing-for-beginners.html
7	3/1	Data and Systems Integration Basics	http://ptgmedia.pearsoncmg.com/images/9780321200686/samplepages/0321200683.pdf https://www.enterpriseintegrationpatterns.com/docs/EnterpriseIntegrationPatterns_HohpeWoolf_ch03.pdf https://www.enterpriseintegrationpatterns.com/patterns/messaging/ https://www.leanix.net/en/download/the-complete-overview-of-enterprise-integration-patterns
8	3/8	<ul style="list-style-type: none"> • Non-Functional Requirements <ul style="list-style-type: none"> ○ Scalability ○ Interoperability & Integration ○ Extensibility ○ Reliability ○ Information Security ○ Regulatory Compliance • Mid-term project checkpoint 	Book extract https://www.scaledagileframework.com/nonfunctional-requirements/
	3/15	Spring Break	

9	3/22	Documenting Software Architecture – Enterprise Architecture	Book Extract LeanIX Documents at https://www.leanix.net/en/resources/download https://www.leanix.net/en/download/how-to-answer-the-top-questions-of-enterprise-architecture-stakeholders https://www.leanix.net/en/download/the-definitive-guide-to-business-capabilities https://www.leanix.net/en/download/enterprise_architecture_success_kit https://www.leanix.net/en/download/reshape-your-it-with-24-key-enterprise-architecture-viewpoints https://www.leanix.net/en/download/best-practices-to-define-technology-stacks https://www.leanix.net/en/download/best-practices-to-define-data-objects https://www.leanix.net/en/download/24-enterprise-architecture-views-financial-services https://www.leanix.net/en/download/the-definitive-guide-to-application-portfolio-management
10	3/29	Documenting Software Architecture - UML Diagramming & Design Artifacts	https://c4model.com/ https://www.uml.org/what-is-uml.htm https://sparxsystems.com/resources/tutorials/uml2/index.html
11	4/5	Productizing the right architecture <ul style="list-style-type: none"> Creating a service catalog 	https://github.com/servicecatalog/documentation/blob/master/Development/oscm-doc-user/resources/manuals/common/en/Overview.pdf
12	4/12	Enterprise Architecture frameworks <ul style="list-style-type: none"> The Open Group Architectural Framework (TOGAF) 	The TOGAF® Standard, Version 9.2 (opengroup.org) https://pubs.opengroup.org/architecture/togaf92-doc/arch/ https://iacis.org/iis/2006/Urbaczewski_Mrdalj.pdf https://www.leanix.net/en/download/an-agile-framework-to-implement-togaf-with-leanix-enterprise-architecture-tool

			https://www.leanix.net/en/download/poster-agile-enterprise-architecture-framework
13	4/19	<ul style="list-style-type: none"> • Maintaining currency and up to date technology standards <ul style="list-style-type: none"> ○ Governance ○ Business drivers • Final Project Checkpoint 	https://pubs.opengroup.org/architecture/togaf8-doc/arch/chap26.html https://www.leanix.net/en/wiki/ea/enterprise-architecture-governance https://www.leanix.net/en/download/enterprise-architecture-roadmap https://www.leanix.net/en/download/overview-of-an-integrated-enterprise-architecture-tool-chain https://www.leanix.net/en/download/smart-ea-governance-in-an-agile-world
14	5/3	Final project presentations	

Duke University Wellness Support Resources

As a student, you may experience personal or academic stress at any point throughout the semester. Duke offers several resources for students to both seek assistance on coursework and improve overall wellness, including, but not limited to:

- DuWell at (919) 681-8421 or duwell@studentaffairs.duke.edu
 - Purpose is to provide students an understanding of what wellness is and how it applies to their lives. [Moments of Mindfulness](#) programs teach practical steps that students can use, in order to facilitate the growth of their personal wellness.
- WellTrack- <https://app.welltrack.com/>
 - Offers a suite of online tools and courses that help you identify, understand and address issues that you are having. Using the variety of tracking and assessment tools and practicing mindfulness can be essential in maintaining your mental health.

The purpose of the above programming is to assist students in having a daily practice of wellness management. If your mental health concerns and/or stressful events negatively affect your daily emotional state, academic performance, or ability to participate in your daily activities, additional resources are available, including:

- DukeReach at <http://studentaffairs.duke.edu/dukereach>
 - DukeReach provides comprehensive outreach services to identify and support students in managing all aspects of their wellbeing. If you have concerns about a student's behavior or health visit the website above for resources and assistance.
- Counseling and Psychological Services (CAPS) at (919) 660-1000
 - CAPS services include: individual, group, and couples counseling services, health coaching, psychiatric services, and workshops and discussions
- Blue Devils Care at bluedevilscares.duke.edu
 - Blue Devils Care is a convenient and cost-effective way for Duke students to receive 24/7 mental health support through TalkNow.