SYST 520 ECE 550 System Engineering Design (3:0:3)
Online Course
Prerequisites: Graduate standing

Description: System design and integration methods are studied and practiced, including structured analysis and object-orientation based techniques. An architecture based approach is used. Students are expected to develop a system design using both the structured analysis and object-oriented techniques presented in the lectures and they will present these designs.

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A. Course Learning Objectives

Overall Course Objective: Learn how to design engineering systems using both the Structured Analysis and the Object Oriented approaches.

Specific Objectives:
1. Learn the four pillars of Structured Analysis: Activity Modeling, Data Modeling, Rule Modeling and Dynamics Modeling
2. Learn the key design description languages used in Structured Analysis and become familiar with other design description languages
3. Learn how to design the functional and physical architectures using the Structured Analysis approach
4. Learn the basic elements (symbols, syntax, and semantics) of the Unified Modeling Language
5. Learn how to design the functional/logical architecture and the physical architecture using the Object Oriented Approach
6. Understand the role of Testing and Evaluation in the systems engineering process.

B. Course Outcomes:

1. Students will design a single system using two alternative approaches: Structured Analysis and Object Orientation. The design will be developed in stages as specified in the weekly homework assignments. Students will develop a design using current software tools and present the design for review.
2. Students are expected to become proficient in the use of the design description languages presented in the class lectures.

C. Required Textbook and Course Materials:

1. Dennis M. Buede, *The Engineering Design of Systems,* Wiley, 2009, NY (3rd Edition).

2. The lecture viewgraphs are posted on Blackboard inside each Weekly Module folder. They are included in two forms: (a) one slide per page, in .pdf, suitable for viewing on a monitor/screen, and (b) two slides per page handout form, in .pdf, suitable for printing.

3. The Lecture transcripts are in PowerPoint Note format; each viewgraph has the transcribed lecture, slightly edited to improve clarity.

4. Several weekly modules also contain a folder with supplementary material that includes manuals, reports, and standards. There are no copyright restrictions on these materials.

5. The weekly modules also include a folder that contains videos of that week's lecture. The videos are in .mp4 format and can be seen through any video player application on any device.

D. Blackboard:

The Blackboard system will be used for all course activities. For information on how to use Blackboard, if one has not used it in other courses, the following link provides basic information and answers to Frequently Asked Questions:

https://coursessupport.gmu.edu/Students/

E. Technology Requirements

Homework assignments must be delivered, via Blackboard, in Microsoft Word (.docx), PowerPoint (.pptx) or .pdf format.

For carrying out the design, access to the following design tools will be enabled through Blackboard. The folders for these tools are located in the "Software Tools" folder in the Course Content tab of the course's Blackboard site.

StarUML – open source software for UML based designs; no license required

MagicDraw – limited SEOR license for academic purposes

You may also use one of the following if it is available to you through your workplace or other courses.

RSA - IBM's Rational System Architect

Sparx Enterprise Architect

CORE

Files from any of these tools will NOT be acceptable as homework submissions. The designs must be copied and inserted either in MS Word or PowerPoint documents.

F. Homework, Midterm, and Final Examination

There are weekly reading assignments and homework assignments. All the weekly assignments are posted on Blackboard under the Assignments tab. Assignments are due by noon Monday following the week in which they are assigned, as indicated in the Table below. There are 11 weekly homework assignments as specified in the Table.

The Midterm consist of the preparation of a PowerPoint presentation of the Structured Analysis design and an oral presentation (via Blackboard) of the design. Detailed instructions for the presentation will be posted on Week 7.

The Final Examination is a closed-book but limited time examination. It covers all the material in the course (class lectures, textbooks, selected supplementary readings, videos). It includes design questions, True/False statements, and various types of design problems. The time allotted for the examination is 2 hours and 20 minutes. The George Mason University Honor Code applies to the Final examination as it applies to every aspect of the course.

G. Honor Code

The George Mason University Honor Code can be found at
http://oai.gmu.edu/the-mason-honor-code-2/

H. Grading

Homework assignments will be graded on a scale of 0 to 100 with letter grades corresponding to numerical ranges (A 91 to 100, B 81 to 90, etc.).

Rubrics for the homework and the midterm are:

Excellent: Project is developed in stages with continuous feedback to previous stages. Midterm presentation addresses how stakeholder objectives were met. The design components are all well integrated and there is full concordance among the models.

Competent: The system has been designed, but all the stakeholder requirements have not been met. Concordance among design models can be further improved.

Needs work: Design process is weak resulting in a not fully integrated design of the systems and with discernible errors in model concordance. The presentation is not cogent.

I. Course Grade

Homework sets will count for 50% of the final grade. The midterm presentation will count for 20% of the grade, and the final examination for 30%. The final grade for the course will follow the guidance provided in the GMU catalog for graduate courses (A, A-, B+, B, B-, C, F).

J. Attendance, Participation, and Course Policies

There are no requirements for attendance and there are no class/team activities that require participation.

Each student is individually responsible for staying within the weekly schedule. Only under very extenuating circumstances will an extension to the homework submission deadline be given.
It is the nature of the design process that the various stages be done in the prescribed order and in a timely manner. There are no provisions for extra credit, make-up exams, etc. Since each student taking the asynchronous distance learning course works independently, individual scheduling arrangements, when appropriate, that are consistent with university policies can be made. Experience has shown that if one falls behind in the homework assignments it becomes very hard to catch up.

K. The Course Plan and Schedule

SYST 520 ECE 550	DE Fall 2016			
Date			Subject	
Week 1	Aug. 29 - Sept. 4	Mod 1	Introduction to Systems Engineering; Design and Integration	HW1
Week 2	Sept. 5 - Sept. 11	Mod 2	Operational Concepts and Use Cases; Requirements	HW2
Week 3	Sept. 12 - Sept. 18	Mod 3	Structured Analysis: Activity Modeling (IDEF0 and DFD)	HW3
Week 4	Sept. 19 - Sept. 25	Mod 4	Structured Analysis: Data Modeling (IDEF1x and E-RD)	HW4
Week 5	Sept. 26 - Oct. 2	Mod 5	Behavior Modeling: Rule Modeling and Dynamics Modeling (STD)	HW5
Week 6	Oct. 3 - Oct. 9	Mod 6	Model Concordance, Functional Architecture	HW6
Week 7	Oct. 10 - Oct. 16	Mod 7	Physical Architecture, System Design, and Interface Design	HW7
Week 8	Oct. 17 - Oct. 23		**Midterm: Design Presentations**	
Week 9	Oct. 24 - Oct. 30	Mod 8	Architecture Frameworks	HW8
Week 10	Oct. 31 - Nov. 6	Mod 9	Object Orientation and UML	HW9
Week 11	Nov. 7 - Nov. 13	Mod 10	UML Behavior Diagrams and SysML	
Week 12	Nov. 14 - Nov. 20	Mod 11	The Object Oriented Design Process and Functional Design	HW10
	Nov. 21 - Nov. 27		Thanksgiving	
Week 13	Nov. 28 - Dec. 4	Mod 12	OO Process: System Design, SOA; Integration and Qualification	HW11
Week 14	Dec. 5 - Dec. 11	Mod 13	Review and Closure	
Week 15	Dec. 13		**Final Exam**	

L. Disability Services Process

Disability Services (DS) collaborates with students with documented disabilities and faculty to provide reasonable accommodations, auxiliary aids, and support services that are individualized and based upon medical documentation, functional limitations, and a collaborative assessment of needs. For specific information, go to:

http://ods.gmu.edu/students/services/.php

M. Diversity, Religious Holidays, etc.

This is an asynchronous distance education course and is designed to operate on a weekly basis. This should enable students to observe religious holidays without affecting their performance in the course or meeting course requirements. However, if a special situation arises that cannot be handled within the course framework, the student is expected to alert the instructor and then follow university-approved procedures. For available services see:

http://odime.gmu.edu

N. Student Privacy

This course adheres fully to the student privacy rules as articulated in the Registrar's page:

http://registrar.gmu.edu/students/privacy/

O. Announcements

On occasion, if warranted, special course announcements will be posted on Blackboard. This is a rare event. In the Syllabus tab, there is a very detailed schedule for the course showing the weekly announcements: reading assignments, available slides of lectures, available videos, and specification of the homework assignments. The individual weekly announcement is also included as a separate file names "Course Plan for week x" in the weekly module folder.