ZACHRY DEPARTMENT OF
CIVIL ENGINEERING
TEXAS A&M UNIVERSITY

CVEN 641
CONSTRUCTION ENGINEERING SYSTEMS

COURSE OUTLINE – SPRING 2017

Section 600, Monday, Wednesday, Friday @ 8:00-8:50 AM, CVE 214, Class
Friday @ 11:30 AM-01:20 PM, CVE 217, Lab

INSTRUCTOR: Dr. Ali Mostafavi
CE/TTI Bldg. Room 709C; 979.845.4856
Office hours: WF 3:30PM-5:00PM or by appointment
Email: amostafavi@civil.tamu.edu

Class Notes: **Mandatory** Course Packets on ecampus, series of pdf files that students should download and print

COURSE PURPOSE:
The topics discussed in this course are positioned at the intersection of project management, system engineering, and decision theory. The course will introduce students to the theory of system engineering in construction engineering projects. Primary emphasis will be placed on the application of systems and decision theory to project planning and analysis. Various analytical, simulation, and statistical techniques will be presented using computer applications.

COURSE OBJECTIVES:
Objectives for the course are as follows:
1. Utilize concepts and methods of systems theory in the analysis of projects;
2. Design and analyze complex processes related to operation and execution of construction projects;
3. Recognize and analyze dependencies between various processes and networks in construction project systems;
4. Utilize concepts and methods from decision theory in project planning and analysis.

5. Understand different methods of abstraction to analyze processes and organizations embedded in construction project systems;
6. Capture and analyze uncertainty of various sources in analyzing risk and resilience in project systems;
7. Develop oral and written communication skills through presentations and assignments similar to real-world experiences;
8. Promote a cooperative and fun learning environment.

LEARNING OUTCOMES:

At the end of the course, students should be able to:

1. Gain a holistic understanding of construction projects as interconnected processes and systems;
2. Abstract and analyze different processes and networks in project systems;
3. Discuss the importance of system engineering approaches in the design and planning of construction project systems;
4. Recognize and analyze dependencies between system elements and their impacts on the performance of construction projects;
5. Implement decision-making under uncertainty in project planning;
6. Conduct diagnostic and prognostic analysis on construction engineering systems;
7. Apply tools and techniques used in assessment of risk and resilience in projects;
8. Perform as an effective team member in preparing deliverables for a project; and
9. Write technical reports and present results for typical project deliverables required for project planning and analysis.

LEARNING PEDAGOGIES:

Different learning pedagogies are used in this course to enhance your learning experience:

1. *System thinking*: The central focus of this course is system thinking and its importance in project planning and analysis. Various system thinking concepts are discussed;
2. *Model-based learning*: The system concepts and theories will be applied through the use of different modeling techniques that enable a holistic understanding of different components and interdependencies in construction engineering and project systems.
3. *Active learning*: Part of each class time will be used for team activities in which you will work with your team to discuss and apply the concepts and methods presented in the lecture.

COURSE APPROACH, ASSIGNMENTS, GRADING, AND PARTICIPATION:

This course is composed of six topic modules. Each module will focus on specific theories and tools for planning and analyzing construction engineering systems. Each module includes a number of assignments. Assignments are to be done and turned in by individual students unless specified otherwise. You are encouraged to discuss them with your classmates, but to prepare your own work. In the case where a discussion with a classmate was helpful, courtesy dictates that this be acknowledged in the assignment. Selected assignments will be graded. You will not know if an

assignment will be graded until after it has been turned in. Assignments should be submitted via eCampus before the due date and time.

Computer Programs: There are different software programs (e.g., EZ STROBE, Cambridge Advanced Modeler (CAM), Organization Risk Analyzer (ORA), and @RISK) used in this course. These programs are either already available through university license or free for education purposes. The students will receive instructions on how to install and use these programs.

EZ STROBE: http://www.cem.umich.edu/Ioannou/strobosys/Stroboscope/installation.htm
CAM: https://www-edc.eng.cam.ac.uk/cam/get/
ORA: http://www.casos.cs.cmu.edu/projects/ora/download.php

Lab: The Lab Section of the course is held every Friday. The Lab Section is intended for the students to get involved in hands-on modeling activities related to course topics and assignments. In addition, presentations (by students) and discussions on Emerging Topics in Construction Engineering Systems are made during the lab time.

Emerging Topics Presentations: Students will select topics related to emerging areas in construction engineering systems and will make a 30-minutes presentation (followed by discussion) in class. Students will review 3-5 articles related to the state-of-the-art for an emerging topic and will make summary presentation to other students in class. Examples of emerging topics include, but are not limited to: project resilience, system integration, project complexity, automated project control, agent-based modeling of construction systems, and advanced probabilistic risk analysis in projects.

Take-home Exam: There will be one midterm exam to be held late in the semester. There will be no final exam.

Grading: The final grade for the course will be based on the students' understanding of the course material as evidenced by their performance on examinations, assignments, and class participation. Grades will be assigned based on a 1000 total possible points:

Class Participation	**100**
Assignments	**600**
Emerging Topics Presentation	**50**
Mid-term Exam	**250**

OFFICIAL NOTICES

Attendance Policy

Attendance is required at all class sessions. Unexcused absences and late arrivals will be penalized. A class sign-up sheet will be circulated during each lecture and will become the record of each

students' attendance during the semester. The professor MUST be notified of any anticipated absences in writing (email). Students who are requesting an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code (See Rule 24). Otherwise, the absence will be noted as unexcused. Each student is allowed a maximum of two (2) unexcused absences. Three unexcused absences will result in zero points in class participation grade. Four unexcused absences will result in a grade of "I" or "F" depending on whether or not the student is passing all other respects at the time of the fourth absence.

Professor Travel Dates

A few class sessions might be affected due to business travels of the professor. The students will be notified in advance. In these cases one of the following scenarios might happen: (1) a guest lecturer will teach the class; (2) the class materials will be recorded by the professor and will be made available to the students; (3) a make-up session will be scheduled; or (4) the class time will be used for team activities related to term project of case study assignments.

Americans with Disabilities Act

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, Division of Student Affairs at the following url - http://disability.tamu.edu/ or at Cain Hall, Room B118, 845-1637.

Academic Integrity Statement

"An Aggie does not lie, cheat, or steal or tolerate those who do." Students are expected to understand and abide by the Aggie Honor Code presented on the web at: http://student-rules.tamu.edu/aggiecode. No form of scholastic misconduct will be tolerated. Academic misconduct includes cheating, fabrication, falsification, multiple submissions, plagiarism, complicity, etc. These are more fully defined in the above website. Violations will be handled in accordance with the Aggie Honor System Process described on the website.

The handouts used in this course are copyrighted. By "handouts," I mean all materials generated for this class, which include but at not limited to syllabi, notes, quizzes, exams, in-class materials, review sheets, and additional problem sets. Because these materials are copyrighted, you do not have the right to copy the handouts unless I expressly grant permission.

Cheating on quizzes and exams will not be tolerated. Cheating will be reported and handled in accordance with the Aggie Honor System Process. Some or all examinations will be closed book; "looking at another student's examination or using external aids (for example, books, notes, calculators, conversation with others, or electronic devices)" during these examinations is a violation of Texas A&M Aggie Honor Code, Cheating, unless specifically allowed in advance by the instructor.

Unless specifically allowed in advance by the instructor, all assignments, and homework in this class are expected to be completed based on individual/group effort. Copying the work of others, including homework, is a violation of Texas A&M Aggie Honor Code, Cheating.

Disclaimer
The syllabus is a plan. The professor reserves the right to make changes in the syllabus. Students will be notified accordingly.

COURSE SCHEDULE

Module	Topics	Tool	Schedule
Module 1: Design and Simulation of Construction Operations	Introduction to Construction Operation Simulation	EZ STROBE	Week 1-5
	Overview of Discrete Event Simulation		
	Activity Cycle Diagrams: Resources, Activities, Queues		
	Building a simple Construction Operation model in EZ Strobe		
	Probabilistic analysis of field data		
	Design of simulation experiments and output analysis		
Module 2: Dynamics of Project Organizations	Introduction to Network Analysis	ORA	Week 6-8
	Network Analysis Measures		
	Meta-Network Modeling of Complex Projects		
	Assessment of Project Organization Risks and Vulnerability		
Spring Break	No Class	-	Week 9
Module 3: Decision-Making under Uncertainty	Overview of Probability	@Risk + Precision Tree	Week 10
	Decision Tree		
	Probability Encoding		
	Probabilistic Risk Analysis		
Module 4: Probabilistic Schedule Analysis	Overview of Project Scheduling	Netpoint + GPM + NetRisk	Week 11-13
	Linking Risks and Project Schedule		
	Probabilistic Schedule Analysis		
Module 5: Project Progress and Performance Assessment	Progress Measurement Techniques	Spreadsheet	Week 14
	Performance Assessment Methods		
	Metrics that Matter		
Module 6: Analysis of Interdependencies in Complex Projects	Complexity and interdependencies in project systmes	CAM	Week 15
	Process Modeling		
	Dependency Structure Matrix		
	Change Predication		

SPRING 2017 CALENDAR: NO CLASS DATES

MARCH: Monday 13 - Friday 17, Spring Break.

APRIL: Friday 14, Reading day, no classes.

MAY: Wednesday 03, Reading day, no classes.

MAY: Thursday 04 – Tuesday 09, Spring semester final examinations for all students.