ENGR 400 Principles of Systems Engineering
Winter 2020
ONLINE COURSE: January 06 - 24

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Email is the best way to contact me.

COURSE DESCRIPTION: Systems engineering is an interdisciplinary approach and means to enable the realization of successful systems. It focuses on defining customer needs and required functionality early in the development cycle, documenting requirements, then proceeding with design synthesis and reliability improvement while considering the complete problem including operations, performance, test, manufacturing, cost, and schedule. This course emphasizes the links of systems engineering to fundamentals of decision theory, statistics, and optimization. The course also introduces the most current, commercially successful techniques for systems engineering.

PREREQUISITES: Junior standing in an engineering discipline; EE 210 or EM 221, or EM 222 and STAT 301: 3 Credit hours

COURSE GOALS: The goal of this course is to provide the student with an introduction to systems engineering with an emphasis on the following topics: the systems engineering process, requirements, design fundamentals, subsystem fundamentals, trade studies, integration, technical reviews, case studies and ethics. The course is also intended to prepare the student for their senior design course (CE498, EE401 and ME412).

COURSE OUTCOMES:

- Develop a systems engineering perspective of how complex systems are conceived, developed and implemented.
- Establish and mature the knowledge and comprehension of the value and purpose of systems engineering.
- Establish a working knowledge of the methods and tools systems engineers use.
- Understand the roles of systems engineers and develop the ability to contribute to the development of complex systems.

Knowledge, Skills, and Abilities Students Should Have Before Entering This Course: Communicate technical information accurately and concisely – both orally and in writing, use analysis, computer software, word

processors, etc., to define and develop solutions to technical problems in engineering.

Knowledge, Skills, and Abilities Students Gain From This Course: This course will give students an initial exposure to the field of systems engineering as it applies to complex systems. The students will also be exposed to concepts regarding team organization, design fundamentals, and work ethics. These topics will be in preparation for their senior design course experience. They will learn that systems engineering is iterative and will develop judgment that will allow them to compare and evaluate engineering alternatives. They will learn to discuss systems engineering methods and processes as well as engage in systems thinking.

TEXTBOOK:

Currently, a single textbook is not available for this class. Lecture materials will be provided and additional materials will be distributed on the course Blackboard website. Additional reading assignments and reference materials will also be provided throughout the course.

OTHER ITEMS NEEDED:

- Access to a computer (preferably your own) with a reliable Internet connection.
- A working web cam with working microphone (you will do a MediaSite video)
- Microsoft Word in docx, file format.
- Adobe Acrobat Reader (a free download from Adobe.com).
- Additional technical requirements can be found in the Technical Requirements course menu link in the Blackboard course.

COURSE POLICIES:

Use of Technology

This is an online course where all required work will be completed online through the use of Blackboard and the Internet. If you do not know how to use Blackboard, tutorials are available online (see page 1).

Attendance Policy

While there is no formal attendance policy, you will be expected to complete assignments according to the course schedule.

Email and Blackboard Announcements

We will use Blackboard Announcements as a way of communicating with the whole class during this course. All Blackboard Announcements will also be sent via email. Therefore, please watch your email, or Blackboard Announcements, for course communication.

Evaluation
Your course grade will be based on the work outlined in this syllabus and schedule. Grades are always available on Blackboard (My Grades). To complete this course, you must successfully complete each assignment and activity on the Syllabus.

Late Work
As in a typical online class, you are expected to complete assignments by the scheduled due date. If circumstances beyond your control arise, contact me as soon as possible. No work will be accepted after the end date of the course. I strongly recommend that you do not wait until the last minute to submit your work. If your work does not meet the criteria, you may not have time to improve your submissions prior to the end date of the course.

Work Submission
Work for this course will take happen in your Blackboard course site.

Assignments submitted to the Principles of Systems Engineering course must be submitted in docx or pdf or pptx file format, or else I cannot open/grade them. Assignments not submitted in one of those file formats will not be graded.

Failure of Technology
Blackboard can sometimes have issues. If you have issues with Blackboard, please contact the IT Help Desk at 270-745-7000.

ADA Notice: Disability and Accommodations
Distance Learning supports the provisions of General Standard 8, Accessibility and Usability in the QM Rubric. Distance Learning strongly supports reasonable accommodation for all participants.

This course is offered through Blackboard, which is in conformance with the Web Content Accessibility Guidelines (WCAG) 2.0 Priority AA, issued December 2012 by Deque Systems. For more information on Blackboard and its development, please visit the Blackboard Accessibility webpage (http://www.blackboard.com/Platforms/Learn/Resources/Accessibility.aspx).

This course includes the following:

- ALT tags that contain appropriate information about the graphic and/or activity.
- Appropriate color combinations that minimize color blindness effects.
- Appropriate font and font-size combinations to improve readability.
- Minimal use of bullets and/or charts that may be confusing to participants who use electronic readers.
- Transcripts and/or closed captioning for video and audio clips.

The above features demonstrate the Center for Innovative Teaching and Learning's understanding of the importance of providing a learning environment that supports qualified participants. Participants who require additional accommodations should contact their mentor.

Respectful Behavior and General Civility
In our classes, engage in free and open discussions of what we think and feel about the things we read and write. In order that we all feel comfortable expressing opinions freely, we ask that

everyone be respectful of each other, even if we do not agree about everything. We can disagree and still be respectful.

BLACKBOARD:
Blackboard will be used extensively throughout this course.

- Homework will be posted in the Announcement Section of the Blackboard site and due dates in the course calendar.
- Class material will be posted in appropriate folder.
- Student grades will be posted in the Grade Center.

Blackboard Help/WKU IT Help Desk
270-745-7000

Make Sure You Know How to Use Blackboard

Bb Student User Training
If you have not used Blackboard as a student, or if this is your first online class, I *highly* recommend signing up for and completing the Blackboard Student User Training. These are topical modules that even those who have used Blackboard a lot have told us are helpful.

To sign up, go to Blackboard and sign in, and click the IT TRAINING tab (top, toward the right, black with white writing). Look for IT Blackboard Student User Training… you will gain instant access upon signing up. This is not required, but it could be very helpful for you and important for your success!

WKU Online Student Resource Center
You may also want to visit the WKU Student Resource Center: http://www.wku.edu/online/src/

COURSE GRADE:
The final course grade will be determined as follows:

Discussions (5)	15 %
Assignments (5)	15 %
Quizzes (2)	40 %
Final Exam (1)	30 %

Scores for work will be based on the following rubric:

Letter Grade	Numeric Equivalent	Qualitative Description (Typical)
A	> 90%	Exemplar; no to minor mistakes.
B	> 80%	Proficient; several minor mistakes; almost no conceptual mistakes.
C	> 70%	Apprentice; several mistakes, some major; conceptual mistakes.
D	> 60%	Novice; many significant mistakes and conceptual errors.
F	< 60%	Non-response or completely incorrect response.

STUDENT DISABILITY SERVICES:
In compliance with university policy, students with disabilities who require accommodations (academic adjustments and/or auxiliary aids or services) for this course must contact the Office

for Student Disability Services in DUC A-200 of the Student Success Center in Downing University Center. The phone number is 745-5004.

Please DO NOT request accommodations directly from the professor or instructor without a letter of accommodation from the Office for Student Disability Services.

SEXUAL MISCONDUCT/ASSAULT POLICY:

Western Kentucky University (WKU) is committed to supporting faculty, staff and students by upholding WKU's Title IX Sexual Misconduct/Assault Policy (#0.2070) at https://wku.edu/eoo/documents/titleix/wkutitleixpolicyandgrievanceprocedure.pdf and Discrimination and Harassment Policy (#0.2040) at https://wku.edu/policies/hr_policies/2040_discrimination_harassment_policy.pdf.

Under these policies, discrimination, harassment and/or sexual misconduct based on sex/gender are prohibited. If you experience an incident of sex/gender-based discrimination, harassment and/or sexual misconduct, you are encouraged to report it to the Title IX Coordinator, Andrea Anderson, 270-745-5398 or Title IX Investigators, Michael Crowe, 270-745-5429 or Joshua Hayes, 270-745-5121.

Please note that while you may report an incident of sex/gender based discrimination, harassment and/or sexual misconduct to a faculty member, WKU faculty are "Responsible Employees" of the University and **MUST** report what you share to WKU's Title IX Coordinator or Title IX Investigator. If you would like to speak with someone who may be able to afford you confidentiality, you may contact WKU's Counseling and Testing Center at 270-745-3159.

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Tentative Schedule

Week	Lecture Topics	Discussions/Assignments
I	1. Introduction to Systems Engineering Module	Assignment #1
	2. Project Life Cycle Module (Waterfall Process Model, Spiral Process Model, "Vee" Process)	Discussion#1: Failure to Launch Discussion
	3. Requirements Module: The Basics and Types of Interfaces	Assignment #2
	4. Scope and Concept of Operations (ConOps)	Discussion #2: Requirements
	5. System Architecture Module	Quiz #1 Review
	Quiz #1: Friday, January 10	
II	6. Analytical Hierarchy Process Module Tools 1 Examples	Assignment #3
	7. Functional Analysis Module (IDEF Model, Functional Flow Block Diagram, Time Line Analysis)	Discussion #3: Selecting the Way to the Moon
	8. Robust Design Module (Taguchi Method)	Book Project
	9. Design Fundamentals Module	Assignment #4
	10. Design Margins Module	Quiz #2 Review
	Quiz #2: Friday, January 17	
III	11. Technical Performance Measures (N Squared Interface and Probability & Statistics)	Discussion #4: Senior Project Final Reports
	12. Economic Evaluation Module Cost Estimating - The Basics, Models, Probabilities	Assignment #5
	13. Risk Management Module (Risk Matrix, Fault Tree, Failure Mode Analysis)	Discussion #5:
	14. Reliability Module (Inspection, Analysis, Demonstration, Test)	Book Project Due
	15. Verification Module (Inspection, Analysis, Demonstration, Test) Course Assessment	Final Exam Review
	Final Exam: Friday, January 24	
	Grades due on January 28 by noon	