# IE 6490: Introduction to Systems Engineering in Design – 3 Credits

## Course Syllabus - Generic

### Instructor:
Dean Pichette

### Email & Phone:
dpichette@wayne.edu (313) 577-5473

### Time & Location:
Depends on semester, ISE Conference Room

### Office Location:
Room #2073, Manufacturing Engineering Building

### Office Hours:
1 hour before class or by appointment

### Teaching Assistant:
None

### Prerequisites:
None

### Course Description:
This course provides an introduction to the engineering and analysis of human-made systems with an emphasis on the process of bringing systems into being. It will include an introduction to systems sciences and engineering and will follow the engineering process from conceptual systems design through concept selection, concept validation, life-cycle acquisition, life-cycle costing, software development, system architecture, and risk management. This course will also address system engineering program evaluation including: evaluation requirements, evaluation of the system engineering organization, and program reporting, feedback, and control. Text book and lecture material will be reinforced via problems, exercises, and a term project framing and defining a system engineering opportunity.

### Course Learning Outcomes:
After completing this course, students will be able to:
- Describe Systems Engineering from concept through program evaluation
- Define systems engineering as well as the importance of systems engineering in today's complex engineering environment
- Calculate product or service solutions in a systems context
- Employ the system design process
- Practice several key system analysis and design evaluation methods and processes
- Use system context, the system engineering development process, and system engineering program evaluation via a term project
- Demonstrate collaboration on the term project in a team environment simulating (as well as can be accomplished in a classroom environment) the methods and processes used in a work environment.

### Textbooks:
Recommended Text:

### Other Materials and Resources:
Lecture slides and other reference material included in the Course Documents tab in Blackboard. Homework Assignments are provided in the Assignments tab in Blackboard.

### Grading:
90 to 100 points A, 80 to 89 points B, 70 to 79 C. Final grades will be based on the following elements: individual homework assignments (40%), individual quizzes (10%), team homework assignments (20%), a term project (20%), and a term project presentation (10%).

### Homework Policy:
Assignments are due the week they are assigned. Individual assignments are to be submitted in the “Individual Homework Assignments” Content area in Blackboard. Team assignments must be submitted via email to dpichette@wayne.edu.

Late Assignments: Students are expected to turn in all of the assignments on time. However, students are allowed a grace period until the class date of the following week with no penalty to allow for workload fluctuations in your work or school environment. Any assignments submitted more than one week late will receive a zero grade.
Exams: There are no exams in this class.

Projects: Term Project (team):
The purpose of the Term Project is to provide the students, in a team environment, with an opportunity to apply the principles of System Engineering to a real-world situation.

- Select an engineering opportunity.
- Frame the engineering opportunity in a system engineering context.
- Define the system engineering process.
- Define the system engineering methodology.
- Identify individual students responsible for each of the 12 elements that will comprise the project.
  -- System engineering context
  -- Conceptual system design
  -- Requirements engineering
  -- Concept selection
  -- System validation
  -- Life-cycle acquisition
  -- Life-cycle costing
  -- System architecture
  -- Risk management
  -- Evaluation requirements
  -- Evaluation of the system engineering organization
  -- Program reporting requirements

Select individual roles and responsibilities for the presentation.
Prepare and deliver a 20 minute PowerPoint presentation.

NOTE: You are not expected to deliver an engineering opportunity; rather, your objective will be to identify an engineering opportunity, frame it in a system engineering context, and determine how each of the elements would be addressed if the opportunity were selected for implementation.

Attendance Policy: Attendance is mandatory. If there is a need to miss class (e.g., business travel, illness), students must notify me via email BEFORE the scheduled time for the class.

Wayne State University Policies and Procedures

Religious Holidays: Because of the extraordinary variety of religious affiliations of the University student body and staff, the Academic Calendar makes no provisions for religious holidays. However, it is University policy to respect the faith and religious obligations of the individual. Students with classes or examinations that conflict with their religious observances are expected to notify their instructors well in advance so that mutually agreeable alternatives may be worked out.

Student Services:
  - The Academic Success Center (1600 Undergraduate Library) assists students with content in select courses and in strengthening study skills. Visit http://success.wayne.edu for schedules and information on study skills workshops, tutoring and supplemental instruction (primarily in 1000 and 2000 level courses).
  - The Writing Center is located on the 2nd floor of the Undergraduate Library and provides individual tutoring consultations free of charge. Visit http://clasweb.clas.wayne.edu/writing to obtain information on tutors, appointments, and the type of help they can provide.

Class Recordings: Students need prior written permission from the instructor before recording any portion of this class. If permission is granted, the audio and/or video recording is to be used only for the student’s personal instructional use. Such recordings are not intended for a wider public audience, such as postings to the internet or sharing with others. Students registered with Student Disabilities Services (SDS) who wish to record class materials must present their specific accommodation to the instructor, who will subsequently comply with the request unless there is some specific reason why s/he cannot, such as discussion of confidential or protected information.

Academic Dishonesty – Plagiarism and Cheating: Academic misbehavior means any activity that tends to compromise the academic integrity of the institution or subvert the education process. All forms of academic misbehavior are prohibited at Wayne State University, as outlined in the Student Code of Conduct (http://www.doso.wayne.edu/student-conduct-services.html). Students who commit or assist in committing dishonest acts are subject to downgrading (to a failing grade for the test, paper, or other course-related activity in question, or for the entire course) and/or additional sanctions as described in the Student Code of Conduct.
Cheating: Intentionally using or attempting to use, or intentionally providing or attempting to provide, unauthorized materials, information or assistance in any academic exercise. Examples include: (a) copying from another student’s test paper; (b) allowing another student to copy from a test paper; (c) using unauthorized material such as a "cheat sheet" during an exam.

Fabrication: Intentional and unauthorized falsification of any information or citation. Examples include: (a) citation of information not taken from the source indicated; (b) listing sources in a bibliography not used in a research paper.

Plagiarism: To take and use another’s words or ideas as one’s own. Examples include: (a) failure to use appropriate referencing when using the words or ideas of other persons; (b) altering the language, paraphrasing, omitting, rearranging, or forming new combinations of words in an attempt to make the thoughts of another appear as your own.

Other forms of academic misbehavior include, but are not limited to: (a) unauthorized use of resources, or any attempt to limit another student’s access to educational resources, or any attempt to alter equipment so as to lead to an incorrect answer for subsequent users; (b) enlisting the assistance of a substitute in the taking of examinations; (c) violating course rules as defined in the course syllabus or other written information provided to the student; (d) selling, buying or stealing all or part of an un-administered test or answers to the test; (e) changing or altering a grade on a test or other academic grade records.

Student Disability Services:
If you have a documented disability that requires accommodations, you will need to register with Student Disability Services for coordination of your academic accommodations. The Student Disability Services (SDS) office is located at 1600 David Adamany Undergraduate Library in the Student Academic Success Services department. SDS telephone number is 313-577-1851 or 313-577-3365 (TTD only). Once you have your accommodations in place, I will be glad to meet with you privately during my office hours or at another agreed upon time to discuss your needs. Student Disability Services' mission is to assist the university in creating an accessible community where students with disabilities have an equal opportunity to fully participate in their educational experience at Wayne State University. Please refer to the SDS website for further information about students with disabilities and the services we provide for faculty and students: http://studentdisability.wayne.edu/

Students who are registered with Student Disability Services and who are eligible for alternate testing accommodations such as extended test time and/or a distraction-reduced environment should present the required test permit to the professor at least one week in advance of the exam. Federal law requires that a student registered with SDS is entitled to the reasonable accommodations specified in the student’s accommodation letter, which might include allowing the student to take the final exam on a day different than the rest of the class.

Course Drops and Withdrawals:
In the first two weeks of the (full) term, students can drop this class and receive 100% tuition and course fee cancellation. After the end of the second week there is no tuition or fee cancellation. Students who wish to withdraw from the class can initiate a withdrawal request on Academica. You will receive a transcript notation of WP (passing), WF (failing), or WN (no graded work) at the time of withdrawal. No withdrawals can be initiated after the end of the tenth week. Students enrolled in the 10th week and beyond will receive a grade. Because withdrawing from courses may have negative academic and financial consequences, students considering course withdrawal should make sure they fully understand all the consequences before taking this step. More information on this can be found at: http://reg.wayne.edu/pdf-policies/students.pdf

Deferred Grade:
A grade of 'I' can only be assigned if all of the following criteria are met:
1. the student IS NOT currently failing the class and,
2. there is NOT a substantial quantity of work yet to be completed,
3. there is no extra work required of the instructor beyond the normal duties of grading the paper/exam,
4. there is no need for the student to attend the class in subsequent terms.

The final decision to assign an incomplete grade rests with the instructor. An 'I' grade MUST be made up within one year of assignment of the grade.

Course Schedule:
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<th>Date</th>
<th>Topic</th>
<th>Reading</th>
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<tr>
<td>Week #1</td>
<td>Systems Thinking</td>
<td>Lecture Slides</td>
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<td></td>
<td>Systems Context</td>
<td>P-Diagram Material</td>
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<td></td>
<td>Team Identification of Term Projects</td>
<td>Homework #1</td>
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<td></td>
<td>Selection of Teams</td>
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<td>Week #2</td>
<td>System Engineering Overview</td>
<td>Chapter 1</td>
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<td>Definition of System Engineering</td>
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<td>The Importance of System Engineering</td>
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<td>Week #3</td>
<td>System Engineering Process</td>
<td>Chapter 3, 5</td>
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<td></td>
<td>Conceptual System Design</td>
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<td>Week #4</td>
<td>Requirements Engineering</td>
<td>Chapter 2</td>
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<td>Homework #3</td>
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<tr>
<td>Week #5</td>
<td>Concept Selection</td>
<td>Chapter 2</td>
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<td>Homework #5</td>
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<td>Week #6</td>
<td>System Validation</td>
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<td>Homework #6</td>
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<td>Week #7</td>
<td>Life-Cycle Acquisition</td>
<td>Chapter 6</td>
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<td>Appendix E</td>
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<td>Homework #7</td>
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<td>Week #8</td>
<td>Life-Cycle Costing</td>
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<td>Homework #8</td>
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<td>Week #9</td>
<td>System Architecture</td>
<td>Chapter 1, 2</td>
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<td>Homework #9</td>
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<td>Week #10</td>
<td>Risk Management</td>
<td>Chapter 6</td>
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<td>Homework #10</td>
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<td>Week #11</td>
<td>Evaluation Requirements</td>
<td>Chapter 5</td>
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<td>Chapter 8</td>
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<td>Homework #11</td>
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<td>Week #12</td>
<td>Evaluation of the System Engineering Organization</td>
<td>Chapter 8</td>
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<td>Homework #12</td>
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<tr>
<td>Week #13</td>
<td>Program Reporting Requirements</td>
<td>Chapter 6</td>
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<td>Term Project Due</td>
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Term Paper:
Term paper (individual): The term paper will consist of an in-depth analysis of a topic covered in the first nine weeks of class about which you would like to develop a better understanding. You are expected to reference several articles (a minimum of 3) from sources such as INCOSE, IEEE, Google Scholar, or Ebscoost discussing the relevant topic and may include case examples. The paper should be approximately eight pages of text (using no larger than 12 pt. Font and standard margins) plus references and appendices. The following is a suggested outline:

- A brief overview of the topic.
- Why the topic is important in the field of Systems Engineering (or your company).
- Synthesis of key issues and discussion of several articles and / or case examples.