

# SYS 590: Systems Engineering Processes and Professional Competencies

## Course Information

**Course name:** Systems Engineering Processes and Professional Competencies

**Course credit hours:** 3 credits

**Offered:** Spring 2024

**Mode:** Asynchronous online

**Prerequisites:** Graduate-standing (all students from all majors are welcome)

## Instructor Contact Information

- David D. (Dave) Walden, ESEP
  - Email: [ddwalden@purdue.edu](mailto:ddwalden@purdue.edu)
  - Phone/Text: +1-952-807-1388
  - Expectations: The primary means of communication with the instructor should be via Brightspace. Typical instructor response times will be less than 48 hours. Urgent requests can be sent via text or email. Phone calls should be avoided.

## Course Description

This course covers life cycle processes performed by systems engineers and soft skills essential to being a successful systems engineer. Topics include systems engineering technical processes, technical management processes, organizational strategies and operations supporting system development, tailoring of processes to industry sectors and domains, cross-cutting systems engineering methods, specialty engineering, systems engineering competencies, and relevant soft skills.

## Course Learning Outcomes (CLOs)

By the end of the course, students will be able to:

1. **CLO1:** Identify the organization, content, and key principles of the INCOSE Systems Engineering Handbook
2. **CLO2:** Critique primary literature on systems engineering practices and competencies and apply these concepts to the practice of systems engineering
3. **CLO3:** Synthesize systems engineering life cycle processes and competencies to create tailored applications of the concepts for an industry or organization
4. **CLO4:** Identify key components of INCOSE systems engineering certification and create a certification application
5. **CLO5:** Create a professional development plan through self-assessment of systems engineering professional competencies

### Learning Resources, Technology & Texts

- **INCOSE Systems Engineering Handbook Fourth Edition (SEH4E) (required).** A PDF version of this handbook will be downloaded by students from the INCOSE Store after they have registered as an Associate Member of INCOSE under Purdue’s Corporate Advisory Board membership. Hard copy versions of the handbook will be available for purchase at a discount using a discount code from the INCOSE Store. Details and directions for registering with INCOSE will be provided in Brightspace.
- **INCOSE Systems Engineering Competency Framework (ISECF) (required).** A PDF version of this handbook will be downloaded by students from the INCOSE Store.
- Other publications listed as references in Handbook and Competency Framework.
- Additional primary source publications selected by instructor.
- Brightspace learning management system.
- Circuit peer-review tool (students will access for free via Brightspace).

### Grading

Review the table below for details.

Assessment Type	Description	% of Final Grade
Participation	You will have the opportunity to earn some participation points in this course by completing the required Honor Code Quiz and by completing two Participation Assignments in discussion forums by the end of the course.	10%
Quizzes	Short quizzes will be used to assess your understanding of the material for each module. After each quiz is graded, you will have the opportunity to review feedback for each question. Quizzes will be timed (students will have 20 minutes to complete each 10-question quiz). Students will have one attempt to complete each quiz, and quizzes should be completed individually.	45%
Peer Assignments (Circuit)	There will be Peer Assignments based on primary source material. Instructions for each assignment will be provided in the Circuit platform, and you will submit your assignment and also participate in self and peer reviews within the Circuit platform. It is very important to remain aware of the due dates for each phase of the Peer Assignments. If you miss any due date, you will be unable to proceed to the subsequent phases of the assignment and will receive a score of zero for the assignment (see the <i>Course Schedule</i> below for a list of all required due dates).	45%

### Grading Scale

Your Purdue course grade will be based on the following grading scale:

Letter Grade	Percentage
A+	97-100%
A	93-96%
A-	90-92%
B+	87-89%
B	83-86%
B-	80-82%
C+	77-79%
C	73-76%
C-	70-72%
D+	67-69%
D	63-66%
D-	60-62%
F	<60%

### INCOSE Certification Exam Equivalency

Achieving a course grade of 85% or higher will waive the requirement to take the INCOSE CSEP/ASEP exam. This score will be determined based upon the grading table above. Purdue will provide a list of students to INCOSE who have earned equivalency after course completion. Note that you will still have to apply for ASEP or CSEP and pay the application fee via the INCOSE certification process (see [Certification Program Overview \(incose.org\)](http://incose.org)).

### Course Schedule and Timing

This is an accelerated 8-week, 3-credit course and will move at a much quicker pace than a normal full-semester 3-credit course, which is delivered over a 16-week period. All course material\* is available on the first day of the course. However, you will see some suggested review dates for you to complete the module materials in the *Course Schedule* below. There are eight modules in this course, and you should take one week to complete each module. Although you may work ahead as needed, you are encouraged to follow the suggested schedule to maintain a steady pace throughout this course and to avoid getting too far ahead of your peers in this class. The due dates for the module quizzes, peer assignments, and participation assignments are **required**. Please review the *Course Schedule* carefully to keep track of all important due dates.

*\*You must complete the Honor Code Quiz in order to access the module quizzes.*

**Course Schedule**

Modules	Suggested Dates*	Quizzes	Assignments
1. INCOSE Certification, Systems Engineering Overview, and Life Cycle Concepts	Monday, 1/8 - Sunday, 1/14	<ul style="list-style-type: none"> <li>● <b>Module 1 Quiz</b> <ul style="list-style-type: none"> <li>○ Due Date: <b>Sunday, 1/14 11:59 PM ET</b></li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● <b>Participation Assignment 1: Certified Systems Engineering Professional (CSEP) Application</b> <ul style="list-style-type: none"> <li>○ Discussion &amp; Confirmation Due: <b>(Module 7) Sunday, 2/25 11:59 PM ET</b></li> </ul> </li> <li>● <b>Peer Assignment 1: Systems Science/Systems Thinking (SS/ST)</b> <ul style="list-style-type: none"> <li>○ Content Due: <b>Sunday, 1/14 11:59 PM ET</b></li> <li>○ Peer Reviews &amp; Self Review                             <ul style="list-style-type: none"> <li>■ Starts: Monday, 1/15 Midnight ET</li> <li>■ Due: <b>Sunday, 1/21 11:59 PM ET</b></li> </ul> </li> </ul> </li> </ul>
2. Concept Definition and System Definition	Monday, 1/15 - Sunday, 1/21	<ul style="list-style-type: none"> <li>● <b>Module 2 Quiz</b> <ul style="list-style-type: none"> <li>○ Due Date: <b>Sunday, 1/21 11:59 PM ET</b></li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● <b>Peer Assignment 2: Architecture</b> <ul style="list-style-type: none"> <li>○ Content Due: <b>Sunday, 1/21 11:59 PM ET</b></li> <li>○ Peer Reviews &amp; Self Review                             <ul style="list-style-type: none"> <li>■ Starts: Monday, 1/22 Midnight ET</li> <li>■ Due: <b>Sunday, 1/28 11:59 PM ET</b></li> </ul> </li> </ul> </li> </ul>
3. System Realization and System Deployment & Use	Monday, 1/22 - Sunday, 1/28	<ul style="list-style-type: none"> <li>● <b>Module 3 Quiz</b> <ul style="list-style-type: none"> <li>○ Due Date: <b>Sunday, 1/28 11:59 PM ET</b></li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● <b>Peer Assignment 3: Concepts of Integration</b> <ul style="list-style-type: none"> <li>○ Content Due: <b>Sunday, 1/28 11:59 PM ET</b></li> <li>○ Peer Reviews &amp; Self Review                             <ul style="list-style-type: none"> <li>■ Starts: Monday, 1/29 Midnight ET</li> <li>■ Due: <b>Sunday, 2/4 11:59 PM ET</b></li> </ul> </li> </ul> </li> </ul>
4. Specialty Engineering	Monday, 1/29 - Sunday, 2/4	<ul style="list-style-type: none"> <li>● <b>Module 4 Quiz</b> <ul style="list-style-type: none"> <li>○ Due Date: <b>Sunday, 2/4 11:59 PM ET</b></li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● <b>Peer Assignment 4: "-ilities"</b> <ul style="list-style-type: none"> <li>○ Content Due: <b>Sunday, 2/4 11:59 PM ET</b></li> <li>○ Peer Reviews &amp; Self Review                             <ul style="list-style-type: none"> <li>■ Starts: Monday, 2/5 Midnight ET</li> <li>■ Due: <b>Sunday, 2/11 11:59 PM ET</b></li> </ul> </li> </ul> </li> </ul>

<p>5. Technical Management, Agreement, and Organizational Strategy &amp; Operations</p>	<p>Monday, 2/5 - Sunday, 2/11</p>	<ul style="list-style-type: none"> <li>● <b>Module 5 Quiz</b> <ul style="list-style-type: none"> <li>○ Due Date: <b>Sunday, 2/11 11:59 PM ET</b></li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● <b>Peer Assignment 5: Leading Indicators</b> <ul style="list-style-type: none"> <li>○ Content Due: <b>Sunday, 2/11 11:59 PM ET</b></li> <li>○ Peer Reviews &amp; Self Review                             <ul style="list-style-type: none"> <li>■ Starts: Monday, 2/12 Midnight ET</li> <li>■ Due: <b>Sunday, 2/18 11:59 PM ET</b></li> </ul> </li> </ul> </li> </ul>
<p>6. Application of Systems Engineering and Cross-cutting Methods</p>	<p>Monday, 2/12 - Sunday, 2/18</p>	<ul style="list-style-type: none"> <li>● <b>Module 6 Quiz</b> <ul style="list-style-type: none"> <li>○ Due Date: <b>Sunday, 2/18 11:59 PM ET</b></li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● <b>Peer Assignment 6: Benefits of Modeling</b> <ul style="list-style-type: none"> <li>○ Content Due: <b>Sunday, 2/18 11:59 PM ET</b></li> <li>○ Peer Reviews &amp; Self Review                             <ul style="list-style-type: none"> <li>■ Starts: Monday, 2/19 Midnight ET</li> <li>■ Due: <b>Sunday, 2/25 11:59 PM ET</b></li> </ul> </li> </ul> </li> </ul>
<p>7. Systems Engineering Competency Framework</p>	<p>Monday, 2/19 - Sunday, 2/25</p>	<ul style="list-style-type: none"> <li>● <b>Module 7 Quiz</b> <ul style="list-style-type: none"> <li>○ Due Date: <b>Sunday, 2/25 11:59 PM ET</b></li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● <b>REMINDER: Participation Assignment 1</b> <ul style="list-style-type: none"> <li>○ Discussion &amp; Confirmation Due: <b>Sunday, 2/25 11:59 PM ET</b></li> </ul> </li> </ul>
<p>8. Professional Competencies and Soft Skills</p>	<p>Monday, 2/26 - Sunday, 3/3</p>	<ul style="list-style-type: none"> <li>● N/A</li> </ul>	<ul style="list-style-type: none"> <li>● <b>Participation Assignment 2: Skills Assessment and Personal Action Plan</b> <ul style="list-style-type: none"> <li>○ Discussion &amp; Confirmation Due: <b>Sunday, 3/3 11:59 PM ET</b></li> </ul> </li> </ul>

\*All course material is available on the first day of the course. However, you will see some suggested review dates for you to complete the module materials. The due dates for the module quizzes, peer assignments, and participation assignments are **required**.

### Academic Integrity

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing [integrity@purdue.edu](mailto:integrity@purdue.edu) or by calling 765-494-8778. While information may be submitted anonymously, the more information is submitted the greater the opportunity for the university to investigate the concern. More details are available on our course Brightspace table of contents, under *University Policies*.

### Nondiscrimination Statement

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. A hyperlink to Purdue's full Nondiscrimination Policy Statement is included in our course Brightspace under *University Policies*.

### Accessibility

Purdue University is committed to making learning experiences accessible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: [drc@purdue.edu](mailto:drc@purdue.edu) or by phone: 765-494-1247.

### Mental Health/Wellness Statement

**If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed**, try [WellTrack](#). Sign in and find information and tools at your fingertips, available to you at any time.

**If you need support and information about options and resources**, please contact or see the [Office of the Dean of Students](#). Call 765-494-1747. Hours of operation are M-F, 8 am- 5 pm.

**If you find yourself struggling to find a healthy balance between academics, social life, stress, etc.** sign up for free one-on-one virtual or in-person sessions with a [Purdue Wellness Coach at RecWell](#). Student coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign up is completely free and can be done on BoilerConnect. If you have any questions, please contact Purdue Wellness at [evans240@purdue.edu](mailto:evans240@purdue.edu).

**If you're struggling and need mental health services:** Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact [Counseling and Psychological Services \(CAPS\)](#) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS office on the second floor of the Purdue University Student Health Center (PUSH) during business hours.

### **Basic Needs Security**

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support. There is no appointment needed and Student Support Services is available to serve students 8 a.m.-5 p.m. Monday through Friday. Considering the significant disruptions caused by the current global crisis as it related to COVID-19, students may submit requests for emergency assistance from the [Critical Needs Fund](#).

### **Emergency Preparation**

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your @purdue.edu email on a frequent basis.

### **Disclaimer**

This document is subject to change during the semester when deemed necessary.