SYS 50000 Perspectives on Systems - Fall 2025

This syllabus is subject to change with notice. For the most recent updates, see https://purdue.brightspace.com

Instructor: Dr. Ibukun Phillips **E-mail:** poluwase@purdue.edu
Office: Grissom Hall, third floor (312)

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Mondays 4:30pm-5:30pm (EST)

TA Thalia Townsend (townset@purdue.edu).
https://purdue-edu.zoom.us/j/94575851613

Starting on September 3. Wednesdays 8.00pm-9.30pm (EST)

Dr. Ibukun Phillips (poluwase@purdue.edu).
https://purdue-edu.zoom.us/j/6696800386?pwd=blFBOXdvS2ZwWi9XcoEreFlxYndQUT09

It includes weekly discussions on topics related to the course. I encourage our online students to join these sessions.

Thursdays 12noon-1pm (EST)

TA Mahdi Moghaddam (mmoghad@purdue.edu).
https://purdue-edu.zoom.us/j/94225235190

If none of these hours work for you, please reach us via email to make an appointment.

When contacting via email, please always use **"SYS500 Question"** as the **email subject line**.

Course Information: SYS 50000 Perspectives on Systems

Time: Mondays, Wednesdays, and Fridays, 9:30 am – 10.20 am

Location: WANG 2579

Instructional Modality: Hybrid, face-to-face, and online.

The syllabus is subject to change. All dates are tentative.

Course credit hours: 3 credit hours

Prerequisites: Graduate Standing or consent of instructor.

This course uses Brightspace. If you do not have access, please contact me.

Learning Objectives:

This course will provide students with an introduction to various quantitative and qualitative approaches to systems, with case studies, concepts, and readings to support interdisciplinary project work.

Course Description

Engineers are frequently asked to solve problems of how to get entities (which may or may not naturally organize themselves in favorable configurations) to operate together in an effective way to achieve a goal. The term "systems engineering" (SE) is often used to refer to several different concepts, disciplines, and technical skills; engineering is both a set of rules and practices for what we do and the processes of solving problems. However, confusion arises when proponents of one perspective interact with others without a clear understanding of the variety of SE histories and tools. Each can play an important, complementary role in the development of a robust approach to SE and the role of humans in engineering systems.

This course provides an introduction to and references for distinct approaches to SE concepts and tools. Individual assignments and projects will be based on readings from these multiple approaches and selected case studies. Participants will be encouraged to bring their own prior expertise and examples to the discussions and projects. While the course will discuss quantitative topics (including cybernetics, feedback control systems, and statistical process control), the course itself will emphasize a more interdisciplinary conceptual integration rather than a stand-alone analysis of these topics. The course will include the use of some software, including NetLogo.

Topics Covered:

Complexity, Systems Thinking, System Dynamics, Cybernetics, Component-Whole integration, Agent-based modeling, robustness and resilience, Deep Learning, Generative AI, Industry 4.0, Internet of Things.

Textbooks and Web Content:

Handouts, lecture notes, and additional readings will be posted on Brightspace.

https://purdue.brightspace.com

In particular, for Causal-Loop-Diagrams (CLDs), you may check the following book

Meadows, D. H. (2008 / 2012). Thinking in Systems: A Primer. (The book is available online for free at Purdue Libraries https://www.lib.purdue.edu/)

System Certificate:

This course completes one of the requirements of the Graduate Certificate in Systems. For more information about the Systems Certificate, visit https://www.purdue.edu/collaboratory/. Also, you can reach out to Kat Burkhart (caburkha@purdue.edu) for more information and how to apply.

Collaboration and Academic Honesty: Collaboration is highly encouraged in this course. Any act of academic dishonesty may be reported to the Dean of Students and may ultimately lead to the end of your career at Purdue.

Participation & Conduct: You are expected to arrive at class on time, turn off all electronic devices (cell phones, cameras, etc.), and refrain from distracting other students (e.g., sleeping, side conversations, etc.). You are also expected to be active in classroom discussions.

Note: *Audio and video are recorded in the Purdue Online Lecture Capture Classrooms for online students, who are enrolled in the course, to view.*

This is a preliminary syllabus. The content here can change, including the course schedule if needed. Any such changes will be posted on Brightspace.

Class Schedule

Week	Topics
1 (Aug 25, 27, 29)	Introduction to Syllabus | Complexity | Complexity
2 (Sept 1, 3, 5)	**Labor Day (no class)** | Systems Science | System Thinking
3 (Sept 8, 10, 12)	System Thinking | Causal Loop Diagrams
4 (Sept 15, 17, 19)	System Thinking | Causal Loop Diagrams
5 (Sept 22, 24, 26)	Agent-Based Modeling | NetLogo (Fire Model)
6 (Sept 29, Oct 1, Oct 3)	NetLogo (Fire Model) | NetLogo (Virus Model)
7 (Oct 6, 8, 10)	Logistic Map (Chaos) | Agent-based Modeling Validation Methods
8 (Oct 13, 15, 17)	**Fall Break (no class)** | Coupled Map Lattice | Coupled Map Lattice
9 (Oct 20, 22, 24)	Robustness vs Resilience | The Cynefin framework
10 (Oct 27, 29, 31)	Cynefin framework/Cognitive Framing | Levels of Automation | Levels of Automation
11 (Nov 3, 5, 7)	Deep Learning | Deep Learning | Deep Learning
12 (Nov 10, 12, 14)	Generative AI (ChatGPT) | Generative AI (DALL·E 3) | Generative AI (ZeroGPT)
13 (Nov 17, 19, 21)	Internet of Things | Internet of Things | Industry 4.0/5.0
14 (Nov 24, 26, 28)	Industry 4.0/5.0 | **Thanksgiving (no class)** | **Thanksgiving (no class)**
15 (Dec 1, 3, 5)	Case Studies | Case Studies | Case Studies/Q&A
16 (Dec 8, 10, 12)	Case Studies/Q&A

* Schedule and assignments subject to change. Any changes will be posted in the learning management system (Brightspace).

Purdue Academic Calendar and key University dates for the Fall 2025 semester.

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Aug 25 – Classes Begin
Sep 1 – Labor Day (No Class)
Oct 13-14 – Fall Break (No Class)
Nov 26–29 – Thanksgiving Break (No Class)
Dec 13 – Classes End
Dec 15-20 – Final Exams
Dec 20 – Grades Due

Tentative Assignment Schedule for SYS 500 - Fall 2025 (due by 10 pm EST for every submission)

Assignment	Due Date
Assignment 1	Sep 6th (Saturday)
Assignment 2	Sep 21st (Sunday)
Assignment 3	Oct 19th (Sunday)
Assignment 4	Nov 2nd (Sunday)
Assignment 5	Nov 23rd (Sunday)
Assignment 6	Nov 30th (Sunday)
Assignment 7	Dec 13th (Saturday)

Missed or Late Work
Late work is not acceptable. In extreme circumstances, the instructor might accept late work with an appropriate penalty to the score. These circumstances most likely would be those that lead to a student failing to receive a grade of Incomplete in the class. For late homework to be considered for grading, the student must provide the instructor with a written request with justification as to why the circumstance is extreme.

Required Texts
Readings will be made available at the course website on Bright Space before the relevant class session.

Required software
Each student will download NetLogo v6.4.0. It is available free of charge at

https://ccl.northwestern.edu/netlogo/

Additional software will be announced during the semester when needed.

Grading (subject to change with notice):

Grade Category		Points
Assignment 1	Complexity and Systems Science	10
Assignment 2	Causal Loop Diagrams	15
Assignment 3	Agent-Based Modeling	20
Assignment 4	Levels of Automation, Robustness, and Resilience	15
Assignment 5	Deep Learning and Generative AI	15
Assignment 6	IoT and Industry 4.0	10
Assignment 7	Analysis of a Case Study	15
TOTAL		100

Total points	Letter Grade
97	A+
93	A
90	A-
87	B+
83	B
80	B-
77	C+
73	C
70	C-
67	D+
65	D
Below 64	F

Grading
Final grades will be assigned as follows:

A+ = 97-100%
A = 93-96%
A- = 90-92%

B+ = 87-90%
B = 83-86%
B- = 80-82%

C+ = 77-80%
C = 73-76%
C- = 70-72%

D+ = 67-70%
D = 65 - 66%
F = 64% and below

Attendance Policy during COVID-19

On-campus students are expected to attend all classes in person unless they are ill or otherwise unable to attend class. *Students need to inform the instructor of any conflict that can be anticipated and will affect the timely submission of an assignment*
Classroom engagement is extremely important and associated with your overall success in the course. The importance and value of course engagement and ways in which you can engage with the course content even if you are in quarantine or isolation will be discussed at the beginning of the semester. Student survey data from Fall 2020 emphasized students' views of in-person course opportunities as critical to their learning, engagement with faculty/TAs, and ability to interact with peers.

Only the instructor can excuse a student from a course requirement or responsibility.
When conflicts can be anticipated, such as for many University-sponsored activities and

religious observations, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency conflicts, when advance notification to an instructor is not possible, the student should contact the instructor/instructional team as soon as possible by email, through Brightspace.

Accessibility:
Purdue University strives to make learning experiences as accessible as possible. 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 or by phone: 765-494-1247. More details are available on our course Brightspace under Accessibility Information.

Purdue also has assistance available to help you make learning materials accessible. Some examples include:

- *Information from Innovative Learning on Universal Design for Learning*
- *Guidance from Innovative Learning on creating accessible documents*
- *Workshops on accessible materials suggested by the DRC*
- *Contact innovativelearningteam@purdue.edu with questions.*

Bereavement:
Purdue University recognizes that a time of grief is very difficult for a student. The University, therefore, provides the following rights to students facing the loss of a family member through the Grief Absence Policy for Students (GAPS): http://catalog.purdue.edu/content.php?catoid=6&navoid=2035

Use of Artificial Intelligence (AI) or Large Language Models (LLM):
ChatGPT and other AI generators that use large language models can be useful for researching and writing papers. However, you should be aware of their limitations: 1. Errors: AI generators make mistakes. Assume the output is incorrect unless you check the claims with reliable sources.
2. Bias: Their output may reflect bias because the data they are trained on may reflect bias or may not include sufficient data from certain groups. 3. Citation: These tools use existing sources without citation. Therefore, using their outputs puts you at risk of plagiarism. With these limitations in mind, you are welcome to use AI generators to brainstorm and refine ideas, find reliable sources, outline, check grammar, refine wording, and format bibliographies. Beyond bibliographies, you are not allowed to copy and paste material generated by AI and use it in your assignments. At the end of your bibliography, add a note indicating which AI tool you used and how you used it, including the prompt(s) you used and the date(s).

Class Policies:

Late Policy: For every hour late (or portion of), one point will be deducted from your assignment grade**.**

Cell Phone / Personal Device Use: It's understandable the use of personal electronic devices in certain important circumstances. However, ***students must ask the instructor for permission to use their personal electronic devices such as cell phones, tablets, laptops, other smart devices, etc.*** Otherwise, students will be asked to leave the classroom if any device is used for a purpose other than what is asked by the instructor.

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Non-Discrimination Policies: Purdue University is committed to maintaining a community that 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 own 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. More details are available on our course Brightspace table of contents, under University Policies.

Although your attendance in class is vital for you to be successful, the course instructor reserves the right to dismiss from class/lab any student who is not civil and respectful during class/lab.

Course Evaluation: During the last two weeks of the course, you will be provided with an opportunity to evaluate this course and your instructor. Purdue uses an online course evaluation system. You will receive an official e-mail from evaluation administrators with a link to the online evaluation site. You will have up to two weeks to complete this evaluation. Your participation is an integral part of this course, and your feedback is vital to improving education at Purdue University. It is strongly encouraged that you participate in the evaluation system.

Academic Dishonesty ("Cheating") Policies:

Student Honor Pledge - *"As a boilermaker is pursuing academic excellence; I pledge to be honest and true in all that I do. Accountable together - we are Purdue."*

1. 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 e-mailing integrity@purdue.edu or by calling 765-494-8778. While the information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the University to investigate the concern.
2. Any form of cheating will result in a penalty up to an automatic "F" grade for the course. All instances of cheating will be forwarded to the Office of Student Rights and Responsibilities for appropriate disciplinary action.
3. Helping another student to cheat and cheating are considered equal cases of academic dishonesty and will be treated as outlined above.
4. Giving another student an electronic copy of your homework or access to your computer account constitutes cheating on your behalf if that other student copies or uses any files that become implicated in a cheating case.
5. Cheating via plagiarism is a particularly heinous form of academic dishonesty. Students are expected to know when and how to properly cite the published and unpublished intellectual property of other scholars. They are expected to understand that paraphrasing intellectual property is just as bad as directly copying or editing another's work.

Plagiarism:

- Stealing or passing off the ideas or work of another as one's own, and
- Paraphrasing or using someone else's words or ideas without crediting the source.

Plagiarism is an act of fraud and academic misconduct. *Penalties for academic*

misconduct can range from a reprimand to a penalty as severe as a suspension for a definite time or even indefinite suspension. For more information, please visit http://www.plagiarism.org
The instructor reserves the right to submit any and all research papers to Purdue's plagiarism detection software service and act upon any negative results. Any form of plagiarism will result in a zero score for the assignment and a one-letter grade penalty for the course; the case may also result in an "F" grade for the course at the instructor's discretion. The case will also be forwarded to appropriate university offices for disciplinary action, up to and including expulsion from the program and University.

6. For a complete definition of academic dishonesty, see http://www.purdue.edu/ODOS/osrr/integrity.htm

Class Readings & Assignments:

You are expected to have the assigned readings (as listed in your Class Schedule) completed for the corresponding class meetings. Since unexpected events may occur (e.g., school cancellations), the class schedule is tentative, and I reserve the right to make any changes throughout the semester. If any change occurs to the class schedule, you will be notified promptly, so you can plan accordingly.

Remember, an emergency on your part does not make it an emergency on mine. Please do not procrastinate. All of the readings and assignments are laid out for you, so keep up in class because you never know when something you cannot control will happen (that is to say, you get sick, someone passes away, etc.).

Re-Grading Policies:

1. A student wishing to request a re-grade for any coursework should return their paper with a written statement explaining the re-grade request. Any re-grade request must be submitted no later than 72 hours after the material has been returned to the student.
2. Any work returned for a re-grade may be totally re-graded, not merely those portions which the person wishes to be re-graded.
3. Discussion of corrected assignments and exams, as opposed to requests for re-grades, may be done during an office hour or by appointment.
4. According to University regulations, only final course grades can be "appealed." There is a formal University timetable and process for grade appeals. It must be followed exactly! Questions about grade appeals should be directed to the Department Head of School of Industrial Engineering or the Chair of the College of Engineering Grade Appeals Committee.

Purdue University Online Writing Lab (OWL): Provides *free* writing consultations and grammar assistance on assignments in Heavilon Hall 226 or visit https://owl.english.purdue.edu/.

Student Bill of Rights: The information herein is in accordance with the Purdue Student Bill of Rights, which may be located at
https://www.purdue.edu/studentregulations/student_conduct/studentrights.html

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Course Materials: Some of the course material has been adapted from other department courses, and lab contributions have been provided by other Purdue students and modified for this course.

Syllabus Change Policy: Except for changes that substantially affect the implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advance notice.