ISyE 4112 A • Workflow Design in Manufacturing and Service
Fall 2026

Instructor

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Overview

- **Catalog description**: Introduction to the modeling, analysis and design of workflow systems in manufacturing systems and service systems such as healthcare systems, banks, service centers and warehouses.
- **Course description**: This course is to develop models for the design, operation and analysis of workflow systems in factories, service systems and warehouses. We will discuss key performance indicators (KPIs), decision variables and the parameters that impact the performance of the workflow systems. We will develop symbolic and mathematical models that are based on probability, statistics, queuing, News Vendor and optimization. The KPIs in workflow systems include cycle or response times, throughput, work-in-process (WIP), costs due to setup, holding and uncertainty, or delays. The first part of the course focuses on modeling the dynamics in workflow system. The second part is to design the control of the workflow systems through planning, scheduling or pull control systems. The third part is to apply the flow models to warehouses and distribution centers with the addition of key spatial indicators in space utilization and travel.
- **Course pre-requisites**: ISyE 2028/3030 – Basic Statistical Methods; ISyE 3233 – Stochastic Manufacturing & Service Systems
- **Co-requisites**: ISyE 3133 – Engineering Optimization
- **Delivery**: This is a residential course with class sessions held at the scheduled time and location.
- **Learning environment**: This class is a learning environment, both inside and outside the classroom. Learning will occur through a mix of class lectures and discussion, plus online discussion forums, homework, and team projects. During class time, you should absolutely ask questions if you are unclear about something. Also, you should actively take notes rather than rely on material posted online. Pre-recorded lectures and other material will occasionally be posted on Canvas.
- **Learning and AI**: With the availability of powerful AI assistant technology, engineering practice is shifting. Engineering must combine human judgment and creativity with AI. The course assignments will reflect this along the following lines.
    - Determining the right problem to solve – human judgment and creativity are primary
    - Performing design and analysis – AI technology can be used extensively but with human creativity, judgment, understanding and verification

    - Selecting and justifying the best solution – human judgment and creativity are primary
- **Course outcomes**: Upon successful completion of this course, you will be able to:
    - Describe the factors that impact the operations of workflow systems;
    - Describe the important performance objectives or KPIs and their relationships;
    - Apply symbolic and mathematical workflow models to describe workflow systems;
    - Identify and determine decision variables to develop alternative designs;
    - Use software tools in solving workflow problems;
    - Work in teams effectively;
    - Understand the social, environmental and economic impact of workflow systems.

Course Materials and Resources

1. **Required textbook**: *Workflow Design in Manufacturing and Service Systems*, by Bodner, Li, Williams & Zhou. Available on Canvas (free). No ISBN.
2. **Optional textbooks**: The following sources may be useful as references. Earlier editions of the first two books are fine. They are not required.
    - Flow systems: *Factory Physics, 3rd Edition*, by Hopp & Spearman
    - Operations planning and scheduling: *Production and Operations Analysis, 8th Edition*, by Nahmias & Olsen
    - Warehousing: *Warehouse & Distribution Science, Release 0.98*, by Bartholdi & Hackman (free download)
3. **Additional readings/videos**: Articles and other additional readings/videos will be posted to Canvas.
4. **Software**: Excel®, Gurobi®, Simio® (available via VLAB).
5. **Modules:** The course is arranged into topical modules with material organized via Modules on Canvas (lectures, assignments, plus other course material).

Assignments and Grading

1. **Grade component weights**:
    - Midterm exams (25% best, 20% worst) 45%
    - Homework 10%
    - Team projects 15%
    - Class participation 5%
    - Final exam 25%
2. **Overall course grade**: The course will be graded based on a straight scale – A (100% to 90%), B (89% to 80%), C (79% to 70%), D (69% to 60%), and F (below 60%).
3. **Exam procedures**: Exams are intended to assess your direct knowledge of course material. There are two mid-term exams and a final exam.

a. Mid-term exams are cumulative but not comprehensive. The final exam is comprehensive. Practice exams will be posted on Canvas. These practice exams will have representative reference material that will be available on the actual exam (e.g., probability tables, etc.).
b. You are responsible for bringing a calculator to all exams. Calculators must be computation-only devices with no internet capability. Cell phones may not be used as calculators. It is strongly recommended that you bring a calculator with power functions and storage registers.
c. You may have a crib sheet for exams. Crib sheet details for each exam will be provided with exam preparation information.
d. Exams will be given out at the start of class, so promptness is important.

4. **Exam grading**: Exam grading is based on problem approach and concepts, data usage, table look-up, mathematical manipulation, and conclusions drawn from analysis. You will generally receive partial credit per these criteria. All effort will be made to return exams within one week.
5. **Homework**: You will have regular homework assignments. They are intended to assess your on-going knowledge of course material and keep you from falling behind in the class. Homework must be submitted by the due date. (The one with the lowest score will be dropped.)
6. **Team projects**: You will be organized into small teams to solve problems that are more complex than the average homework problem.
7. **Class participation**: Lectures will occasionally include examples that allow you as an individual to submit a short participation quiz.
8. **Electronic submission**: Many assignments will be submitted electronically on Canvas. It is highly recommended that you submit the assignment before the deadline and then check to make sure that the correct files(s) have been submitted, and that the submission is complete. A link to a document on a third-party platform is not an acceptable submission.
9. **Make-up exams and late assignments**: Individual make-up exams and late assignment submissions will be offered only if you have a valid reason (severe illness, severe illness or death of an immediate family member, serious accident, important religious holiday, or Institute-approved activities with proper documentation). Such reasons must be submitted as early as possible, preferably well before the due date.
10. **Grade appeals**: Grade appeals should be presented in writing within one week after the graded exams or assignments are returned. A grade appeal may result in the entire exam or assignment being regraded.

Topics and Tentative Schedule

1. The course covers the following topics.
    - **Module 0**: Course Introduction
    - **Module 1**: Introduction to Workflow Analysis & Design

- **Module 2**: Deterministic Workflow
- **Module 3**: Workflow with Variability
- **Module 4**: Controlling Variability
- **Module 5**: Operations Planning
- **Module 6**: Scheduling
- **Module 7**: Introduction to Warehousing
- **Module 8**: Warehouse Design and Analysis

2. The schedule of topics will be posted on Canvas prior to the first day of class.

Academic Integrity

1. **General**: The Honor Code is taken seriously in this class. You should familiarize yourself with its rules and procedures.
2. **Exams**: Exams are individual efforts. The instructional staff takes specific measures to protect against honor code violations on exams.
3. **Collaboration with other students**: You are encouraged to discuss homework problems with your fellow students. However, your final answers must be your own work based on your own understanding. Collaboration rules for other assignments will be included in the assignment instructions.
4. **Using AI assistants**. Recent technology advances have enabled useful AI-based assistants that can perform text-based response tasks. You may use such assistants for non-exam assignments if allowed in the assignment instructions. You must cite your AI assistant source. You may not copy and paste the AI assistant response as your answer. Your answer must be in your own words. Note that AI assistants often include subtle errors and omissions in their responses. You are strongly advised to identify and correct such errors and omissions.

Administrative Policies and Procedures

1. **General**: The Student-Faculty Expectations Agreement provides a framework for creating an atmosphere of mutual respect in the classroom. You are encouraged to review it.
2. **Attendance**: You are encouraged to attend so that you may ask questions and receive the benefit of answers to questions asked by others. In addition, there will be graded class activities. You are responsible for all material presented in class, plus class discussions thereof.
3. **Time zone**: Unless otherwise stated, all times are assumed to be expressed using Eastern Time (ET).
4. **Computers**: You should bring your laptop to class as the class activities typically will require you to use your computer.
5. **Classroom behavior**: Cell phone, tablet and/or computer use is permitted only if you are using the device to take notes or participate in a class activity.

6. **Communication forums**: Announcements will be posted on Canvas, and Canvas Discussions will be used to answer questions of a general nature outside of class. You are encouraged to post questions about class material and homework problems on Canvas Discussions for class discussion. You are responsible for discussion on Canvas Discussions about course material.
7. **Email communications**: You should address all emails about the course to the instructor. Be sure to include the course number in the subject field (ISyE 3104). Many procedural questions are already answered in the syllabus, so please check the syllabus beforehand.
8. **Website outages**: You should download the Ebook, slides and other material from Canvas well in advance of exams. OIT often does upgrades or service activities, and you do not want these items to be unavailable if you are looking for them the night before an exam.
9. **Inclement conditions**: Campus closures or opening delays may occur due to inclement conditions. Class sessions will still be held, broadcast synchronously and recorded if practical (e.g., no power/internet outage). If not practical, an asynchronous in-class session will be recorded and posted during the same week. Exam dates and assignment deadlines may be modified if, in the instructor's judgment, conditions impair successful student learning and performance.

Student Resources and Support

1. **Academic resources:** You are encouraged to use campus academic support resources (Academic Success & Advising) for tutoring and coaching if needed.
2. **Non-academic resources:** Your well-being is important. If you find yourself with a serious non-academic issue, campus resources include the Center for Mental Health Care & Resources, Health Services and Student Life. Georgia Tech provides a comprehensive list of resources. Additionally, you are highly encouraged to be vaccinated against the flu and Covid-19.
3. **Accommodations for individuals with disabilities**: The Office of Disability Services assists with accommodation for individuals with disabilities. If you need accommodation, please contact ODS to obtain an accommodations letter. Please contact the instructor as soon as possible to discuss your individual needs.