Syllabus

ISE 453: Design of Production, Logistics, and Service Systems Spring 2020

Lecture: Tuesday and Thursday, 11:45–1:00 p.m., DAN 216

Instructor: Michael G. Kay
Office: DAN 306
Tel: 515-2008
Email: kay@ncsu.edu

Office Hours: Tue, Thu, 1:30–3:00 p.m.
Or by appointment

TA: Chengyu Zhou
Office: DAN 418
Email: czhou9@ncsu.edu

Office Hours: Mon, Wed, 2:00–3:30 p.m.

Prerequisites: ISE 361 and ST 372

Co-requisite: ISE 311

Computer Requirement: Many of the lectures will have In-class Activities that will require a computer, so bring your laptop to class. The only software that you will need is Excel and a web browser.

Required Text: M.G. Kay, *Lecture Notes for Production System Design*, available as PDF file (see homepage for link)

E-Reserve: Wallace Hopp and Mark Spearman. (2008) *Factory Physics*, Third Edition, McGraw-Hill, New York, NY (selected chapters).

Permanent Course Homepage: `https://people.engr.ncsu.edu/kay/ise453/` (this page will be accessible to you after the semester as a reference). Moodle will only be used for the submission of assignments, most class materials will be posted on the homepage Schedule.

Course Description: Principles and practice in the design of facilities and logistics networks. Integration of capacity planning, facility layout, material handling, storage and warehousing, and supply chain design issues into overall production system design. Emphasis on the economic justification of alternative designs and the use of computer software to aid the design process. Group projects.

Student Learning Outcomes: By the end of this course, students will be able to:

- Formulate models and analyze the performance of a variety of different production system designs
- Perform an economic analysis of alternative designs and understand the limitations of the analysis

- Formulate and utilize heuristic solution procedures for different types of design problems, understand the difference between construction and improvement heuristics, and understand the limitations of any heuristic solution approach
- Discern the fundamental tradeoff in warehouse design between the competing objectives of minimizing building costs and minimizing handling costs
- Apply all of the knowledge and techniques learned in the course to the problem of developing an integrated design of a complete production system.

Course Grading: Unless otherwise noted, all grading will be on a scale of 0 to 100.

Homework Assignments	12%	(lowest grade dropped)
In-Class Assignments	10%	(lowest two grades dropped)
Projects	12%	(breakdown within determined later)
Exams	36%	(18% for each exam)
Final Project	12%	
Final Exam	18%	

Grade Boundaries: Minimum grade in the course based on the following boundaries:

A+ :	100.0 – 96.7	B– :	83.3 – 80.0	D :	66.6 – 63.4
A :	96.6 – 93.4	C+ :	79.9 – 76.7	D– :	63.3 – 60.0
A– :	93.3 – 90.0	C :	76.6 – 73.4	F :	59.9 – 00.0
B+ :	89.9 – 86.7	C– :	73.3 – 70.0		
B :	86.6 – 83.4	D+ :	69.9 – 66.7		

Tentative Topics (see the current ISE 453 Course Schedule for more details)**:**

1. *Facility Location* (4 Lectures)
   Elements of the supply chain; logistics system modeling; great-circle distances and geocoding; minisum location
2. *Freight Transport* (5 Lectures)
   Logistics costs; modes of transport; trucking operations; total logistics cost concept

- Exam 1 (75 min, in-class, one sheet of notes)

3. *Economic Analysis* (2 Lectures)
   Economics of production; discounting; costing; economic analysis of alternative designs
4. *Capacity Planning* (8 Lectures)
   Little's law; make-to-stock vs. make-to-order production systems; basic factory dynamics; line yield; throughput and cycle time feasibility

- Exam 2 (75 min, in-class, one sheet of notes)

5. *Facility Layout* (3 Lectures)
   Material flow; machine layout; quadratic assignment problem; department layout; computer-aided layout improvement procedures
6. *Warehousing* (4 Lectures)
   Basic storage/warehousing functions and elements; storage/retrieval policies; storage layout planning; warehouse operations; order picking; activity profiling

- Final Exam (3 hours, in-class, one sheet of notes; covers mostly material since Exam 2 and uses the Final Project as the context for several comprehensive questions)

Tentative Project Assignments:

1. Facility Location 2. Capacity Planning 3. Facility Layout

Course Schedule: A link to the web version of the course schedule is on the course homepage. The schedule will be updated before and after each lecture and will contain the topic, assignments, and text readings for the lecture. Since the schedule is subject to change, it should be checked on a regular basis.

Submission of Assignments: Unless otherwise notified, you should use Moodle to submit all of the electronic files that you have created for each assignment. Group submissions should be from one Unity ID, with all group members' names listed on all of the documents submitted.

Exam Format: Exams 1 and 2 and the Final Exam are closed book and closed computer. Each student can bring one double-sided sheet of notes and a non-programmable calculator to the exam.

In-class Assignments: There will be a one- or two-page document handed out at the start of most classes that contains several problems that relate to the principal topic covered in class that day. These in-class assignments (ICAs) will be worked on during the class period and do not have to be turned in; instead, they will be graded by answering one or two related questions in Moodle at the end of class. ICAs can be worked on in class in groups of up to four, but each member should individually submit results to Moodle (all members of a group can submit the same results). Since ICAs cannot be turned in late, *your lowest two grades will be dropped*.

Homework: There will be homework assigned that will cover the material discussed in class and in the lecture notes. Most homework will be group assignments (Group of 2) and will be due at the beginning of the next class. Since homework cannot be turned in late, *your lowest grade will be dropped*. If the homework is submitted via Moodle, paper submission is still required for the homework to be graded. *Both* group members' names should be listed on the paper submission along with the *single* Unity ID under which the assignment has been submitted.

Projects: Projects will be group assignments (Groups of 4) and will be completed outside of class, typically using some type of computer package. The percentage breakdown for each

individual assignment within the Projects grade total will be determined at the end of the semester. *All* group members' names should be listed on the paper submission along with the *single* Unity ID under which the project has been submitted.

Final Project: The final project will be a group assignment (Groups of 4) and will be assigned after Exam 2. The grade for the final project will be based on a formal written report.

Late Assignments: Only regular Projects and the Final Project will be accepted late, with an immediate reduction of 20% in the assignment's grade and an additional 20% reduction for each weekday it is late. Homework assignments and ICAs cannot be accepted late.

Re-grading: Questions concerning any grade given for any assignment should be made within one week of the return of the graded assignment.

Academic Integrity: It is understood and expected that all work turned in under your name is your own work or, if a group assignment, the work of you and your group members, and that you have neither given nor received unauthorized aid. The University policy on academic integrity can be found in the Code of Student Conduct (http://policies.ncsu.edu/policy/pol-11-35-01).

Incomplete Grades: If requested by a student, the grade of Incomplete will be given for work not completed because of a serious, documented interruption in the student's work not caused by their own negligence.

Absences and Scheduling Make-up Work: A make-up exam will be scheduled if a student has an excused absence (see http://www.ncsu.edu/provost/academic_regulations/attend/reg.htm for NC State's policy on excused absences). There are no make-up homework and in-class assignments; instead, the lowest one and two grades, respectively, will be dropped.

Students with Disabilities: Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students at 1900 Student Health Center, Campus Box 7509, 515-7653 (http://www.ncsu.edu/dss/). For more information on NC State's policy on working with students with disabilities, please see http://www.ncsu.edu/provost/hat/current/appendix/appen_k.html.