

IE 1082 – Probabilistic Methods in Operations Research

Spring 2021

Course Syllabus

(Subject to change)

Instructor

Changxi Wang, Ph.D. (Email: changxi.wang@scupi.cn)

Office: Zone 4-220

Office Hours: Tuesday 13:20-16:25

Teaching Assistant

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Office Hours: By appointment

Lecture

Tuesday 8:15-11:00; Location: Zone 4-216

Course Description

Introduction to probabilistic methods in Operations Research. Models include game theory; decision analysis; stochastic decision modeling techniques including discrete-time Markov chains, continuous-time Markov chains; and queuing theory. 3 credit hours.

Course Pre-Requisites

MATH 0240, MATH 0280, IE 1070, IE 1081.

Relationship to Student Outcomes

Each Industrial Engineering student will have demonstrated the following:

- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- an ability to acquire and apply new knowledge as needed, using appropriate learning

Textbook

“Introduction to Operations Research”, by Hillier, F.S. and Lieberman, G.J. (2015, 10th Edition), , McGraw-Hill Education, New York, New York, USA.

“Operations Research: Applications and Algorithms”, by W. Winston, 4th edition, Brooks/Cole Learning, 2004.

Other Good References:

"Introduction to Probability Models", by Sheldon M. Ross, 8th ed. Academic Press, 2002

Assessments

Homework assignments, projects, and exam questions related specifically to the objectives above.

Attendance:	10%
Homework:	20%
Mid-Semester Examination:	30%
Final Examination:	<u>40%</u>
	100%

Score	Letter Grade
90.00-100.00	A
85.00-89.99	A-
80.00-84.99	B+
76.00-79.99	B
73.00-75.99	B-
70.00-72.99	C+
66.00-69.99	C
63.00-65.99	C-
61.00-62.99	D+
60.00-60.99	D
0.00-59.99	F

Attendance

There are 16 lectures in the semester. Attendance will be taken for each lecture period. Each student is allowed **two** absences. Each absence, after the third absence, will result in a **1% deduction** from the attendance grade. After the **tenth** absence, the student will not be allowed to take the final exam.

Homework Grading Policy

- Homework problems and other assignments will be assigned periodically and are due as stated. Late submission **will not** be accepted. Submissions must be done on **A4 papers** and **stapled** together at the top left-hand corner. Students' names and ID numbers must be listed on the first page at the top right-hand corner.
- It is totally permitted, and even encouraged, to work with others on the homework. However, I am trusting that you are not simply copying the answers of another student, and instead are actually working together to solve the problems. You are on your honor to abide by this policy.
- Each homework problem is given the grade 1 or 2 or 3 points, where
 - "1" means the problem was not answered, or the submitted answer was "poor"
 - "2" means that the submitted answer was "good"
 - "3" means that the submitted answer was "excellent"
- The grade for the homework is the average of the individual problem grades. For example, if there were 4 problems, and the grades were 2, 1, 3, and 2, then the total grade for the homework assignment is 2 points (out of a possible 3). The final grade for all the homework is the average of the weekly homework grades.

- Homework will be assigned each Tuesday. Your homework must be submitted to Blackboard by noon the following Tuesday. Late homework will be penalized by a grade of 1 point for each problem (so a problem that would have gotten a grade of "2" will get a grade of "1" if it is late).

Exams

There will be two exams, all are CLOSED BOOK, CLOSED NOTES, CLOSED COMPUTER. Students are allowed to bring one A4 page note and it must be hand-written. It cannot be a photocopy. If you must miss an exam, you should make alternative arrangements with the instructor before the exam is given. If you miss an exam without prior notification, you will receive a score of "zero" for that exam except under extenuating circumstances. You will need a scientific calculator.

Make-Up Exams

Students who have not taken both mid-semester and final exams are not eligible for make-up exams. Make-up exams can only be taken by students who have attained between 50.00 % and 59.99 % (out of 100 %) of the total score. Only 75 % of the make-up exam grade can be used to replace the final exam grade. Students taking make-up exams can only attain at most a "D" grade.

Avoiding Plagiarism

1. Unacknowledged direct copying from the work of another person, or the close paraphrasing of somebody else's work, is called plagiarism and is a serious offence, equated with cheating in examinations. This applies to copying both from other students' work and from published sources such as books, reports or journal articles.
2. Paraphrasing, when the original statement is still identifiable and has no acknowledgement, is plagiarism. A close paraphrase of another person's work must have an acknowledgement to the source. It is not acceptable for you to put together unacknowledged passages from the same or from different sources linking these together with a few words or sentences of your own and changing a few words from the original text: this is regarded as over-dependence on other sources, which is a form of plagiarism.

Tentative Course Schedule

Lecture	Week	Dates	Topics	Chapter
1	2	March 9	Course Introduction, Review of Probability and Statistics	24 (Hillier)
2	3	March 16	Game Theory – Two-Person, Zero-Sum Games; Games with Mixed Strategies	15
3	4	March 23	Game Theory – Graphical Solution; Using Linear Programming	15
4	5	March 30	Decision Analysis – Prototype Example; Decision Making without Experimentation	16
5	6	April 6	Decision Analysis – Decision Making with Experimentation; Decision Trees	16
6	7	April 13	Decision Analysis – Utility Theory	16
7	8	April 20	Mid-term Exam Review	
8	9	April 27	Mid-term Exam	
9	10	May 4	Queuing Theory – Basic Structure	17
10	11	May 11	Queuing Theory – Role of Exponential Distribution; Birth and Death Process	17
11	12	May 18	Queuing Theory – Priority Discipline; Queuing Networks	17
12	13	May 25	Markov Chains – Stochastic Processes; Chapman- Kolmogorov Equations	29
13	14	June 1	Markov Chains – Classification of States; Long-Run Properties	29
14	15	June 8	Markov Chains – First Passage of Times; Absorbing States	29
15	16	June 15	Markov Chains – Continuous Markov Chain	29
16	17	June 22	Final Exam Review	
17	18	June 29	Final Exam	