IE 1082 – Probabilistic Methods in Operations Research

Spring 2024

Course Syllabus

(Version 3.7, Subject to change)

Instructor

Changxi Wang, Ph.D. (Email: changxi.wang@scupi.cn)
Office: Liberal Arts Building 4-220, SCUPI New Building 403/407
Office Hours:
Section 1: Tuesday 14:00-17:00
Section 2: Thursday 14:00-17:00

Teaching Assistant

Section 1: Monarch Zhou 周昊鹏 (Email: 2022223030072@stu.scu.edu.cn)
Section 2: Tong Wu 吴桐 (Email: tongwu99@outlook.com)
Office: QQ Group (493514000)

Lecture

Section 1: Tuesday 8:15-11:00; Location: SCUPI New building 212
Section 2: Thursday 8:15-11:00; Location: SCUPI New building 212

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

IE 1070 or IE 1081.

Course Objectives

1. To acquaint students with probabilistic analytical/OR modeling techniques that can be used to support various optimal decision making.
2. To give students experience in building models, deriving solutions and analyzing results through some case studies and assigned homework exercises.
3. Test students' mastery of knowledge through examinations to help students learn this course.

Applicable ABET Outcomes

1. An ability to apply knowledge of mathematical, scientific and engineering to obtain solutions that meet specific needs.
2. An ability to design and conduct experiments, as well as analyze and interpret data.
3. An ability to identify, formulate and solve engineering operations research problems.
4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
5. An ability to learn new technologies and skills according to the needs of engineering practice and their own knowledge base.

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.

Quiz & Attendance:	15%
Homework:	20%
Mid-Semester Examination:	30%
Final Examination:	35%
	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

Exams

There will be two exams, all are CLOSED BOOK, CLOSED NOTES, CLOSED COMPUTER.

Assignments and Quizzes

Homework will be assigned weekly and needed to be finished before the next class. You are encouraged to work on these assignments with your classmates. Late submission will not be accepted. Homework solutions must be submitted to the Blackboard system.

Quizzes may be assigned during the classes. Students need to finish it within a time interval. Late submissions will not be accepted. No make-up quizzes or in-class activities are allowable except under extenuating circumstances.

Students who accumulate 7 absences (without signing in or submitting the quiz) will fail the course. There are no remedial measures.

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

Week	Dates	Topics	Chapter
1	S1: Feb 27 S2: Feb 29	Course Introduction, Review of Probability and Statistics	24
2	S1: March 5 S2: March 7	Game Theory – Two-Person, Zero-Sum Games; Games with Mixed Strategies	15
3	S1: March 12 S2: March 14	Game Theory – Graphical Solution; Using Linear Programming	15
4	S1: March 19 S2: March 21	Decision Analysis – Prototype Example; Decision Making without Experimentation	16
5	S1: March 26 S2: March 28	Decision Analysis – Decision Making with Experimentation; Decision Trees; Decision Analysis – Utility Theory	16
6	S1: April 2 S2: April 11	Decision Analysis – Utility Theory; Queuing Theory – Basic Structure	16, 17
7	S1: April 9	Review	
8	Week 8	Midterm Exam	15-17,24
9	S1: April 23 S2: April 25	Queuing Theory – Role of Exponential Distribution; Birth and Death Process	
10	S1: April 30 S2: May 2	M/M/s queuing models	17
11	S1: May 7 S2: May 9	Queuing Theory – Priority Discipline; Queuing Networks	17
12	S1: May 14	Markov Chains – Introduction, Stochastic Processes;	29
	S2: May 16	Queuing Theory – Priority Discipline; Queuing Networks	17
11	S1: May 21 S2: May 23	Markov Chains – Introduction, Stochastic Processes;	29
12	S1: May 28 S2: May 30	Markov Chains –Chapman- Kolmogorov Equations	29
13	S1: June 4 S2: June 6	Markov Chains – Classification of States; Long-Run Properties	29
14	S1: June 11 S2: June 13	Markov Chains – First Passage of Times; Absorbing States	29
15	S1: June 18 S2: June 20	Markov Chains – Continuous Markov Chain, Final Exam Review	29
16		Final Exam	