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# COURSE INFORMATION

**Course Number and Title:** MSIS2510: Prescriptive Analytics

**Credits:** 4

## Course Description

This course helps students understand the principles of optimization in business decisions, prepare computer-based models from problem descriptions, and determine optimal solutions using software tools. This course also prepares participants to interpret solutions to obtain insights regarding sensitivity to inputs, resource constraints, and their profitability impacts.

## Course Objectives

The following table outlines the course objectives and major assessments for this course.

| Objectives  | Assessments  |
|---|--|
| Formulate a linear programming model based on a given business problem.       | Practice Cases, Application Assignments, Quizzes, Course Project, Final Exam |
| Perform sensitivity analysis to provide managerial insights.                  | Practice Cases, Application Assignments, Quizzes, Course Project, Final Exam |
| Apply linear programming to solve a network problem.                          | Practice Cases, Application Assignments, Quizzes, Course Project, Final Exam |
| Formulate an integer programming model based on a given business problem.     | Practice Cases, Application Assignments, Quizzes, Course Project, Final Exam |
| Apply goal programming and multiple objective optimizations.                  | Practice Cases, Application Assignments, Quizzes, Course Project, Final Exam |
| Describe the difference between linear programming and nonlinear programming. | Practice Cases, Application Assignments, Quizzes, Course Project, Final Exam |
| Use Gurobi Python API to formulate and solve the aforementioned models.       | Practice Cases, Application Assignments, Quizzes, Course Project, Final Exam |

## Pre-Requisite Courses

MSIS2507: Data Analytics With Python

# COURSE DETAILS

# Text and Resource List

## REQUIRED BOOKS

There are no required texts for this course.

## RECOMMENDED BOOKS

Ragsdale, C.T. (2014). *Spreadsheet Modeling and Decision Analysis: A Practical Introduction to Business Analytics* (8th ed.). Thompson/South-Western.

- Please note, in this text, the author references Microsoft Excel for conducting the spreadsheet modeling. In this course, we will be using Gurobi Python API.

## ADDITIONAL MATERIALS

In addition to required readings in the course, the instructor may post articles and videos pertinent to each module's topics in the learning management system. Readings may be taken from sources such as websites, documentaries, blogs, etc.

## Course Structure

The course will follow this general pattern:

- Readings: These are recommended and provide information on the module's main concepts.
- Lecture: Your course author walks through application examples.
- Practice cases: These assignments provide you with opportunities to apply the skills in short scenario-based exercises.
- Assignments: These are more robust and include a combination of application assignments, quizzes and exams, and course project deliverables.

## Outline of Course

This course will be broken up into modules, each of which will last one week. The following outline presents the topics to be covered in each module.

|                  |  |
|------------------|--|
| <b>Module 1:</b> | Introduction   |
| <b>Module 2:</b> | Linear Programming                                   |
| <b>Module 3:</b> | Sensitivity Analysis                                 |
| <b>Module 4:</b> | Network Modeling                                     |
| <b>Module 5:</b> | Integer Programming                                  |
| <b>Module 6:</b> | Binary Integer Programming                           |
| <b>Module 7:</b> | Mixed Integer Programming                            |
| <b>Module 8:</b> | Goal Programming and Multiple Objective Optimization |

|                   |                             |
|-------------------|-----------------------------|
| <b>Module 9:</b>  | Nonlinear Programming       |
| <b>Module 10:</b> | Presentation and Final Exam |

## GRADING

Achievement in this course will be assessed through completion of the following activities:

| Assignment Type         | Points | Grade % |
|-------------------------|--------|---------|
| Application Assignments | 180    | 18%     |
| Quizzes                 | 180    | 18%     |
| Course Project          | 240    | 24%     |
| Group Member Evaluation | 50     | 5%      |
| Final Exam              | 350    | 35%     |
| Total                   | 1000   | 100%    |

## Assignment Type Descriptions

### Application Assignments

These assignments are group-based tasks that provide you with an opportunity to apply key analytics skills, using various datasets.

### Quizzes

Quizzes appear in each module (excluding Module 10) and test your understanding of key themes for each week.

### Course Project

For this assignment, you will leverage what you have learned from this course to analyze a real-world dataset and generate insights from your research.

### Final Exam

The final exam will assess your understanding of content from the entire course. It is highly recommended that you review all the course materials before attempting this task.

## Grading Scale

Grades scales are set by individual faculty members. The following scale will be used for this course:

| Letter | Points  | Range         |
|--------|---------|---------------|
| A      | 940+    | 94%+          |
| A-     | 900-939 | 90%-93.9%     |
| B+     | 870-899 | 87%-89.9%     |
| B      | 840-869 | 85%-86.9%     |
| B-     | 800-839 | 80%-83.9%     |
| C+     | 770-799 | 77%-79.9%     |
| C      | 740-769 | 74%-76.9%     |
| C-     | 700-739 | 70%-73.9%     |
| F      | 0-699   | 69.9% or less |

## COURSE POLICIES

### Late Assignment Policy

It is very important that work be turned in on time or students will find it very difficult to catch up. All work in the course (e.g., projects, papers, exams, quizzes, etc.) will be due by 11:59 pm PT on the date noted on the class calendar.

Any assignment submitted after the due date will have 10% deducted from points earned for each day that it is late. Students should reach out to their instructor immediately to discuss any concerns.

### Faculty Communication and Feedback

At the beginning of each course, make sure that you understand the instructor's preferred mode of communication and any specific communication protocol. In general, faculty will respond to student inquiries within one business day and will grade assignments within one week. However, one of the best ways to be effective as a student is to understand each individual instructor's expectations and operate within those boundaries. If students have concerns about communication or feedback, they should always go to the professor first. Students should explain their concern as clearly as possible without judgment or emotion. Effective communication is an important skill, and every interaction is an opportunity to develop this skill.

## PROGRAM INFORMATION

## Mission of the Leavey School of Business

The Leavey School of Business is a community dedicated to innovative learning and scholarship that transforms people, ideas, and organizations to create prosperity here and around the world. We blend theory and practice, find inspiration in Silicon Valley's entrepreneurial spirit, and are committed to a collaborative learning environment that develops leaders of competence, conscience, and compassion.

## Program Progression

In order to continue in the program, you must maintain a minimum GPA of 3.0 at the end of each quarter.

## Credit Policy

Academic work at Santa Clara University is measured by credit unit. A unit of credit represents that amount of time and effort both within and outside of formal settings that a student devotes to a particular class.

## Academic Integrity

The Academic Integrity pledge is an expression of the University's commitment to fostering an understanding of—and commitment to—a culture of integrity at Santa Clara University. The Academic Integrity pledge, which applies to all students, states:

"I am committed to being a person of integrity. I pledge, as a member of the Santa Clara University community, to abide by and uphold the standards of academic integrity contained in the Student Conduct Code."

Students are expected to uphold the principles of this pledge for all work in this class. For more information about Santa Clara University's academic integrity pledge and resources about ensuring academic integrity in your work, see [SCU's Academic Integrity](#) website and [SCU Library's Plagiarism](#) site.

We ask that you affirm this pledge and apply these principles to your work in this class. Where you use information from a reading, from the web, lecture, or any other source, you must cite as appropriate. Unless it is a paper I have written or something that is my personal intellectual property, please do not cite me. Use the citation I have provided. Do not cite Wikipedia as a source, rather use Google scholar, the library databases, or Wikipedia to find the foundational citation. Consult the library's webpage on avoiding [Plagiarism](#) to learn more about managing references. The library's website on [Academic Integrity](#) also offers information about the ethical and legal implications of using course sharing websites. Specifically, "SCU faculty and staff retain copyright over their teaching materials. Students who upload a faculty or staff member's teaching materials to course-sharing websites are violating copyright." (Santa Clara University Library, (2021), [Academic integrity: Course sharing websites](#)). Why is this important? It's about ethics, intellectual property, and avoiding career limiting outcomes.

The [Student Conduct Code](#) is in effect for all assignments, assessments, in-class exercises and papers. It is the student's responsibility to comply with the Student Code of Conduct (such as to do his/her own work and to cite sources of information, whether paraphrased or quoted). There is zero tolerance of any breach of the Student Conduct Code. The professor maintains responsibility for assigning grades for all assignments and the course grade even if an incident is submitted to the judicial process.

A student who is guilty of a dishonest act in an examination, paper, or other work for a course, or who assists others in such an act will be subject to sanctions, up to and including dismissal from the University, as a result of the judicial process described in the bulletin. Further details, and the protocol followed in case of an allegation of dishonesty can be found on the [Leavey School of Business Policies](#) page.

Breaches of the honor code include but are not limited to:

- Plagiarizing, misrepresenting as one's own work any work done by another. This includes, but is not limited to, all text and exhibits that you find in an article, book, web page (including a firm's web page), previous capstone projects or other research resources. (For more information about plagiarism and how to avoid it see the [Plagiarism.org](http://Plagiarism.org) website.)
- Cheating on quizzes, participation exercises and papers; this includes sharing information on participation exercises between sections
- Submitting the same paper, or substantially similar papers, to meet the requirements of more than one course without the approval and consent of all instructors concerned
- Misrepresentation when explaining missed or late assignments
- Allowing another student to use your academic work

## Citation Expectations

All research work submitted should be properly cited using APA standards. For more information and tools to assist, refer to the information available through the University Library at SCU. There are many resources available through the [Santa Clara University Library](#).

## Group Work

As you advance in your careers, it becomes increasingly important to develop the skill of influencing others and working collaboratively. Similarly, in most workplaces, you will need to collaborate or negotiate with others in order to accomplish their goals.

Teamwork in many courses offers an opportunity for you to learn virtual team leadership and team theory. It is important that you treat your team members with the same respect that you would treat coworkers. Team members will become part of your professional network, so if you work effectively with them, they may become a lifetime resource.

Remember that everyone's style of communication is different, and that it is important to listen carefully and adjust your style when necessary to communicate effectively. You should be proactive when you feel there might be a problem in the group. The situation will not improve if you do not address it.

## STUDENT SUPPORT

### Office of Accessible Education

If you have a documented disability for which accommodations may be required in this class, please contact the [Office of Accessible Education](#) (408-554-4109) as soon as possible to discuss your needs and register for accommodations with the University. If you have already arranged accommodations through OAE, please discuss them with your instructor during my office hours within the first two weeks of class.

To ensure fairness and consistency, individual faculty members are required to receive verification from the Office of Accessible Education before providing accommodations. OAE will work with students and faculty to arrange proctored exams for students whose accommodations include double time for exams and/or assistive technology. Students with approved accommodations of time-and-a-half should talk with me as soon as possible. The Office of Accessible Education must be contacted in advance (at least two weeks' notice recommended) to schedule proctored examinations or to arrange other accommodations.

## Accommodations for Pregnancy and Parenting

In alignment with Title IX of the Education Amendments of 1972, and with the California Education Code, Section 66281.7, Santa Clara University provides reasonable accommodations to students who are pregnant, have recently experienced childbirth, and/or have medical needs related to childbirth. Pregnant and parenting students can often arrange accommodations by working directly with their instructors, supervisors, or departments. In addition, the Office of Accessible Education will provide reasonable accommodations for pregnancy-related impairments which impact a major life activity.

## **Discrimination and Sexual Misconduct (Title IX)**

Santa Clara University upholds a zero-tolerance policy for discrimination, harassment, and sexual misconduct. If you (or someone you know) have experienced discrimination or harassment, including sexual assault, domestic/dating violence, or stalking, I encourage you to tell someone promptly. For more information, please consult the University's [Non-Discrimination, Harassment & Sexual Misconduct Policy](#) or contact the University's EEO and Title IX Coordinator, Belinda Guthrie, at [408-554-3043](tel:408-554-3043), [bguthrie@scu.edu](mailto:bguthrie@scu.edu). Reports may be submitted online through the Office of [Student Life](#) or anonymously through [EthicsPoint](#).

## **Camino Voluntary Product Accessibility Template (VPAT)**

VPAT can be used to evaluate the learning management system's conformance to recommended accessibility standards. Users can review how various Camino features align to Web Content Accessibility Guidelines (WCAG 2.0) and Section 508 of the Rehabilitation Act by visiting the Canvas [Accessibility](#) webpage.

## **In-Class Recordings**

The [Student Conduct Code](#) (p. 13) prohibits students from "(m)aking a video recording, audio recording, or streaming audio/video of private, non-public conversations and/or meetings, inclusive of the classroom setting, without the knowledge and consent of all recorded parties," except in cases of approved disability accommodations. The Student Conduct Code also prohibits the "falsification or misuse, including non-authentic, altered, or fraudulent misuse, of University records, permits, documents, communication equipment, or identification cards and government-issued documents." Dissemination or sharing of any classroom recording without the permission of the instructor would be considered "misuse" and, therefore, prohibited. Violations of these policies may result in disciplinary action by the University. At the instructor's discretion, violations may also have an adverse effect on the student's grade.