USC Viterbi School of Engineering

ISE 536 Linear Programming and Extensions
Spring 2020, Mon, 6:40-9:20 pm
Location: OHE 100B

Instructor: Dr. Parisay
https://ise.usc.edu/directory/faculty/profile/?lname=Parisay&fname=Sima
Office: OHE 310U
Office Hours: Mon and Wed at 4:30-6 pm
Contact Info: parisay@usc.edu

Teaching Assistant: Ying Peng
Office:
Office Hours:
Contact Info: yingpeng@usc.edu

IT Help:
Hours of Service:
Contact Info:

Catalog Course Description
Linear programming models for resource allocation; simplex and revised simplex methods; duality; sensitivity; transportation problems; selected extensions to large scale, multi-objective, and special structured models.

Learning Objectives
This course is designed for those with minimum background in this field and concentrates on application of these techniques, analysis skills, and communication skills.

- Formulation skills for problems as a deterministic linear mathematical model (linear programming, goal (multi-objective) programming, integer programming, transportation, transshipment)
- Travel Sales Person (TSP) problems
- Simplex method for solving linear programming (LP)
- Transportation simplex method
- Dual of an LP and its application
- Extensive sensitivity analysis to answer “what if” questions (for all models) and report writing
- Application of software to solve the problems

Prerequisite(s): EE 441 (Applied Linear Algebra for Engineering), Math 225 (Linear Algebra and Linear Differential Equations)
Co-Requisite (s): None
Concurrent Enrollment: None
Recommended Preparation: None

Course Notes
The course materials are on D2L.

Technological Proficiency and Hardware/Software Required
You will use AMPL software for assignments and any software of your choice for project or case studies.

Required Readings and Supplementary Materials
Required: Course Handouts (Included in course D2L, and in class) by Dr. Parisay.


Description and Assessment of Assignments

- **Midterm exams** will be in-class based on the schedule, closed book, and 1.5 hours in length. Make up exam is only considered under documented emergencies, such as being hospitalized. There will be two midterm exams.
- **Final exam** will be held at the completion of all classes based on the University schedule, closed book, and 2 hours in length. Make up exam is only considered under documented emergencies, such as being hospitalized.
- **Homework** will be assigned each week on Tuesdays. You will submit your answer as a Word file to D2L before the next class on Mondays (unless otherwise indicated). No late homework will be accepted. No makeup homework will be considered. HW is expected to be typed as much as possible and professionally done. A total of 9 HW will be assigned. All will be graded, each 1 point.
- **Project/Case study**: The project in this class is a team activity. I will assign the teams after the Midterm I. Some information in this respect will be posted on D2L later on. The purpose of the project is for you to utilize information you have learned during this class and to prepare a professional report. The project is delivered as a hard copy report and the models on the last class session, as well as posting the Word file of the report on D2L.
Grading Breakdown

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points</th>
<th>% of Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm I exam</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Midterm II exam</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Final Exam</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Homework</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Case study (initial and final report)</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Total points will be curved for the final letter grade. Letter grade with minus and plus are also considered. Please refer to another file called “Grading policy” on D2L for more details.

Additional Policies

Cellular phones should be turned off in class. No texting in class. Computers can only be used for class related material.

Please print lecture materials for each class session from D2L and bring to every class session.
Course Schedule: A Weekly Breakdown

**Readings and Homework:** They will be posted on D2L as lecture proceeds. Homework is due on Mon on D2L before 6 pm.

<table>
<thead>
<tr>
<th>Week</th>
<th>ISE 536 Topics/Daily Activities Tentative (updated and may change)</th>
<th>Readings and HW</th>
<th>Deliverable/Due Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Jan 13</td>
<td>Introduction to the course, Review of linear algebra and Gauss-Jordan method, LP problem formulation, Graphical solution of LP, Simplex method</td>
<td>Chapters 2, 3, and 4</td>
<td></td>
</tr>
<tr>
<td>2 Jan 20</td>
<td>Holiday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Jan 27</td>
<td>Application of software, LP Problem formulation skills</td>
<td>Chapter 3</td>
<td>Homework</td>
</tr>
<tr>
<td>4 Feb 3</td>
<td>LP Sensitivity Analysis</td>
<td>Chapter 5</td>
<td>Homework</td>
</tr>
<tr>
<td>5 Feb 10</td>
<td>Dual Problem of LP</td>
<td>Chapter 6</td>
<td>Homework</td>
</tr>
<tr>
<td>6 Feb 17</td>
<td>Economic Interpretation of Dual LP Review for midterm</td>
<td>Chapter 6</td>
<td>Homework</td>
</tr>
<tr>
<td>7 Feb 24</td>
<td><strong>Midterm I</strong> (1.5 hour) Goal Programming (GP)</td>
<td>Section 4.16</td>
<td></td>
</tr>
<tr>
<td>8 Mar 2</td>
<td>Goal Programming (GP) Sensitivity Analysis and Report Writing</td>
<td>Section 4.16</td>
<td>Homework</td>
</tr>
<tr>
<td>9 Mar 9</td>
<td>Integer Programming, Branch-and-Bound Method Transportation Problem and simplex transportation</td>
<td>Section 9.3</td>
<td>Chapter 7</td>
</tr>
<tr>
<td>10 Mar 16</td>
<td>Spring break</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Statement for Students with Disabilities
Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. Website and contact information for DSP:
http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html, (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) ability@usc.edu.

Statement on Academic Integrity
USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one’s own academic work from misuse by others as well as to avoid using another’s work as one’s own. All students are expected to understand and abide by these principles. SCampus, the Student Guidebook,
(www.usc.edu/scampus or http://scampus.usc.edu) contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A.

Emergency Preparedness/Course Continuity in a Crisis
In case of a declared emergency if travel to campus is not feasible, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of D2L, teleconferencing, and other technologies.

Statement on Academic Conduct and Support Systems

Academic Conduct:
Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct.

Support Systems:
Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. engemannhc.usc.edu/counseling

National Suicide Prevention Lifeline – 1 (800) 273-8255
Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender-based harm. engemannhc.usc.edu/rsvp

Sexual Assault Resource Center
For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: sarc.usc.edu

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086
Works with faculty, staff, visitors, applicants, and students around issues of protected class. equity.usc.edu

Bias Assessment Response and Support
Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. studentaffairs.usc.edu/bias-assessment-response-support

The Office of Disability Services and Programs
Provides certification for students with disabilities and helps arrange relevant accommodations. dsp.usc.edu

*Student Support and Advocacy – (213) 821-4710*
Assists students and families in resolving complex issues adversely affecting their success as a student. EX: personal, financial, and academic. studentaffairs.usc.edu/ssa

*Diversity at USC*
Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. diversity.usc.edu

*USC Emergency Information*
Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. emergency.usc.edu

*USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or to report a crime.*
Provides overall safety to USC community. dps.usc.edu