Catalog description: An introduction to the major mathematical methods of operations research. Included are linear programs and methods of solutions, and network flow models.

Prerequisite: Successful completion of MTH 250 and MTH 261.

Text and Materials:

- Paul R. Thie and Gerard E. Keough *An Introduction to Linear Programming and Game Theory*, 3rd edition, 2008
- Additional on-line resources are listed on the D2L page when needed
- Microsoft Excel\(^1\) - The following Add-ins (File -> Options -> Add-ins) should be loaded:
  - Analysis ToolPak
  - Analysis ToolPak - VBA
  - Solver Add-in

Goals:

- Learn some history and applications of Operations Research and Management Science
- Create linear programming models for basic allocation, covering and blending problems
- Create linear programming models for transportation, assignment and transshipment problems
- Learn and apply the Simplex algorithm to mathematical models of deterministic problems

Outcomes:

1. Demonstrate problem solving skills including creative imagination, logical reasoning, critical evaluation, mathematical modeling and common sense by:
   
   (a) Creating linear mathematical programming models for transportation, assignment, transshipment, basic allocation, covering and blending problems.
   
   (b) Solving linear programs using the Simplex Algorithm via hand and using Solver on Excel.
   
   (c) Doing and explaining the sensitivity analysis resulting from the Simplex Algorithm.

\(^1\) You may choose to use some other spreadsheet such as Numbers or Open Office. However, I am not willing to help you determine errors in your work if you use something besides Microsoft Excel.
(d) Explaining when and how the linear model needs to be changed to accommodate nonlinear or integer constraints and decision variables.

2. Critique the model developed by discussing simplifying assumptions and issues ignored.

Expectations:

**In class:** Come prepared to class. Participate in class by offering solutions, asking questions and working with your group.

**Outside-of-class:** Extensive work for this course, typically involving 8-12 hours per week will be divided among working by yourself and with your group to:

- create mathematical models
- solve mathematical models
- prepare your mathematical models and solutions for analysis and assessment
- prepare for presentations and exams

**NOTES:**

- You will be held responsible for the information and assignments I post in D2L.
- Typically classes will consist of some or all of the following:
  - Interactive lecture
  - Model building
  - Problem solving
  - Computer work
- Creating a good organization system for your notes from in class and taken while reading the texts, the handouts from class, and the section objectives is essential. Minimally, you’ll need a three ring loose-leaf binder. You should expect to rewrite your notes filling in missed details after each class.

**Integrity:** Central to the purpose and pursuit of any academic community is academic integrity. All members of the Westminster community, including students, faculty, staff, and administrators, are expected to maintain the highest standards of honesty and integrity, in keeping with the philosophy and mission of the College. Academic dishonesty is a profound violation of this code of behavior.

The paragraph above is taken from the Westminster College 2018-19 Undergraduate Catalog, page 60. It is imperative that you never submit the work of others as though it is your own work nor should you ever allow anyone else to use your work without giving credit to you. The penalty for academic dishonesty in this class is minimally the grade of 0 on the assignment and, except for unusual circumstances, a grade of F for the course. Any event of academic dishonesty is reported to the Dean of the College. Other details of violations and consequences are given in the Catalog.

**Group work is expected.** You are expected to discuss problems together and reach conclusions together within your own group. In this class, I will consider it is a form of dishonesty for one group to discuss their work with members of another group. It is also a form of dishonesty to encourage or allow such practices on the part of others.
Operations Research requires team participation. Each of you have individual strengths that WILL contribute to your group’s understanding of the problem and a solution of the problem. Cooperation will make the group work more enjoyable.

**Accessibility:** Westminster College actively strives for the full inclusion of all our students. Students with disabilities who require access solutions for environmental or curricular barriers should contact Faith Craig, Director of Disability Resources, located in 414 Thompson Clark Hall.
Phone: 724-946-7192
e-mail: craigfa@westminster.edu

**Assessment:** Evaluative assessment will be based on a point system and consist of

1. Graded homework and papers
2. Quizzes
3. Projects

Points for each assignment will be listed on the assignment. Most work will be done in small instructor assigned groups. I will consider work between groups to be an academic integrity violation. All members of any one group will receive the same grade. I will ask each member of the group to sign the project indicating that he or she has participated as the group expected.

**Attendance policy:** For each unexcused absence beyond the first one, 3% will be deducted from your final percentage of points earned. For example, four unexcused absences when the calculated percentage is 82, your final percentage will be $82 - 3 \times (4 - 1) = 73$.

- **Athletes must let me know about scheduled games and meets one week prior to the match-up.**
- If you are absent when a group for a project is assigned, you will do that project on your own.
- No makeup exams or quizzes will be given except as noted on page 55 of the 2018-2019 Undergraduate Catalog. (…should petition the instructor in writing prior to the scheduled examination date … petition is presented to the dean of the College.) Any exams or quizzes missed will be recorded as a zero. (Very few quizzes and exams are given in the course. Please strive to be here for the few that are. Makeup exams will be given at my convenience, but outside of your other scheduled classes, and will be substantially more difficult.)

**Grades** will be calculated on a point system. At the end of the course you can determine your grade by calculating the percentage of points earned versus points possible. Grade cutoffs will be no higher than

A: 93, A-: 90, B+: 87, B: 83, B-: 80, C+: 77, C: 73, C-: 70, D: 60.