

COURSE APPROVAL ROUTING CHECK LIST

091020

1. Course Number: ACM PSM 620 1st Bulletin 11-5-09  
2nd Bulletin 11-19-09
2. Course Title: Optimization of Discrete Models  
 (no more than 70 characters)

Title Abbreviation: Optimization Disc Mod  
 For use in Master Schedule (no more than 19 characters)

3. Action:  New Course  Revision  IF Designation  WAC


Requested Designation(s): \_\_\_\_\_

Course Proposal/Revision Check List

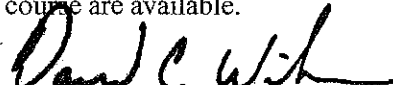
This checklist will help departments avoid some of the most common mistakes made on course proposals. Your use of the checklist will allow the College Senate Curriculum Committee to focus its review on more substantive issues and expedite the approval process.

- Proposal format conforms to the Directory of Policy Statements, Section IV:02.00 (2002).
- Proposal has been proofread for spelling, punctuation, grammar, style and gender-neutral language.
- If the course is a new course, reasons for the additions are included; if the course is a revision of an existing course, reasons for revision and a copy of the old course are included as well as the IF Narrative when appropriate.
- Catalog description follows the guidelines in the Curriculum Handbook, Appendix C.
- Student learning outcomes are coherent with course content and assessment.
- Outcomes are referenced with course content.
- All resource entries are alphabetized and conform to a specific style manual.
- Cross listed courses have been checked with all chairs and deans included in development of the course.

DEPARTMENT ACTION

 10/16/09  
 Chair, Department Curriculum Committee Date

4. **Approved** with confirmation that all necessary laboratories, studios, resources, facilities and personnel for support of this course are available.

 MATH 10/16/09  
 Signature of Department Chairperson Department Date

(OVER)



**Prefix, Number and Name of Course:** PSM 620 Optimization of Discrete Models

**Credit Hours:** 1

**In Class Instructional Hours:** 1    **Labs:** 0    **Studio:** 0    **Field Work:** 0

**Catalog Description:**

*Prerequisite: Admission to the program or instructor permission*

Mathematical analysis and solution of real-world problems that optimize linear objective functions subject to systems of linear inequalities, the two-phase revised simplex method, applications in diverse areas such as business management, industry, economics, finance, and game theory.

**Reasons for Addition:**

To create a one-semester-hour core module for the graduate Professional Applied and Computational Mathematics program where students will formulate and solve mathematical models for optimization problems encountered in a variety of business and industrial settings.

<b>Student Learning Outcomes:</b> Students will	<b>Course Content</b>	<b>References:</b> <b>Assessment:</b>
1. formulate optimization problems mathematically as linear programming (LP) problems.	I	Group work in class, individual homework assignments, exams.
2. solve LP problems by hand and (for larger problems) by use of technology.	II	Group work in class, individual homework assignments, exams, and computer projects.
3. analyze and interpret the solutions to the primal and dual LP problems.	III	Individual homework assignments, exams and computer projects.
4. construct solutions to applied problems from diverse settings using methods from operations research.	IV	Group work in class, individual homework assignments, computer projects, exams.

**Course Content:**

I. Mathematical modeling

- A. Formulating real-world problems as linear programs
- B. Graphical solutions of two-variable problems
- C. Pathological cases

II. Operations research

- A. Simplex method: algebraic derivation
- B. Avoiding pitfalls: Bland's theorem
- C. Revised simplex method: matricial formulation
- D. Implicit prices
- E. Programming the simplex method

### III. Duality

- A. Formulating the dual LP problem
- B. Relationship between the primal and dual problems
- C. Checking optimal solutions
- D. Complementary slackness
- E. Sensitivity analysis

### IV. Selected applications

- A. Allocation of resources
- B. Scheduling production and inventory
- C. The cutting-stock problem
- D. Approximating data by linear functions
- E. Matrix games: minimax theorem

## Resources

### Scholarship:

Albers, D. J., and Reid, C., *An Interview with George B. Dantzig: The Father of Linear Programming*, The College Mathematics Journal, vol. 17, no. 4, 1986.

Beck, E., and Kolman, B., *Elementary Linear Programming with Applications*, Academic Press, 1980.

Bard, J. F., and Jenson, P. A., *Operations Research Models and Method*, Wiley, 2002.

Chvatal, V., *Linear Programming*, W. H. Freeman and Co., 1983.

Dantzig, G. B., *Linear Programming and Extensions*, Princeton University Press, 1963.

Giordano, F. R., Fox, W. P., Horton, S. B., and Weir, M. D., *A First Course in Mathematical Modeling*, 4<sup>th</sup> ed., Brooks/Cole, 2009.

Heyman, D. P., and Sobel, M. J., *Stochastic Models in Operations Research, Vol. I: Stochastic Processes and Operating Characteristics*, Dover, 2004.

Hillier, F. S., and Lieberman, G. J., *Introduction to Operations Research*, Holden-Day, 2002.

Kimball, G. E., and Morse, P. M., *Methods of Operations Research*, Dover, 2003.

Marlow, W. H., *Mathematics for Operations Research*, Dover, 1993.

Phillips, D. T., Ravindran, A., and Solberg, J. L., *Operations Research: Principles and Practice*, 2<sup>nd</sup> ed., Wiley, 1987.

Rao, S. S., *Engineering Optimization: Theory and Practice*, 3<sup>rd</sup> ed., Wiley, 1996.

Simmons, D. M., *Linear Programming for Operations Research*, Holden-Day, 1972.

Taha, H. A., *Operations Research: An Introduction*, 7<sup>th</sup> ed. Macmillan, 2002.

Wagner, H. M., *Principles of Operations Research: with Applications to Managerial Decisions*, 2<sup>nd</sup> ed., Prentice-Hall, 1975.

Winston, W. L., *Operations Research: Applications and Algorithms*, Duxbury Press, 2003.

Periodicals:

*Advanced Modeling and Optimization*

*Computational Optimization and Applications*

*Journal of Computational Mathematics and Optimization*

*Journal of Optimization Theory and Applications*

*Optimization Methods and Software*

*Optimization – A Journal of Mathematical Programming and Operations Research*

*SIAM Journal of Optimization*

Electronic and/or Audiovisual Resources:

COMAP, "MATHmodels, A New Resource to Make Math Modeling a Year Round Activity," <http://www.mathmodels.org/>.

COMAP, "Project Intermath," <http://www.comap.com/undergraduate/projects/intermath/>.

COMAP, "UMAP Tools for Teaching", collection of CD-ROMS available at <http://www.comap.com/product/cdrom/>.

Institute for Operations Research and the Management Sciences (INFORMS), "INFORMS Online," [www.informs.org/](http://www.informs.org/).

ScienceDirect, Elsevier B.V., "Operations Research Letters," [www.sciencedirect.com/science/journal/01676377](http://www.sciencedirect.com/science/journal/01676377).