COURSE APPROVAL ROUTING CHECK LIST

091020

1. **Course Number:** ~~PSM~~ ACM 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

[signature] — 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.

[signature]
Signature of Department Chairperson

MATH — 10/16/09
Department — Date

(OVER)

Faculty (Check one)
- ☒ **SNSS** *School of Natural and Social Sciences*
- ☐ **SOE** *School of Education*
- ☐ **SAH** *School of Arts and Humanities*
- ☐ **SOP** *School of Professions*

DEAN'S ACTION

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

10/26/09 — Karen O'Connor
Date — Signature of Dean (both Dean's if cross-listing)

COURSE PACKET INCLUDES:

- ☐ Electronic proposal form
- ☐ Attached electronic document with explanations of contingencies as stipulated at Dean's level
- ☐ One hard copy of proposal with attached contingencies and routing sheet with all appropriate signatures (copy of routing sheet in packet sent to Academic Affairs)
- ☐ For all revisions, one hard copy of current course should be submitted (e-copy is preferable when available)

COLLEGE SENATE ACTION

1. **Received,** logged and electronic packet and hard copies forwarded to the College Senate Office. Program title to be published in the *College Bulletin.*

10/27/09 — Vincent F. Masci — 091020
Date — Signature of College Senate Office — Log Number

2. Action for Intellectual Foundations' Designation

_____ Recommend approval _____
Signature of Assistant Dean, Intellectual Foundations

_____ Recommend disapproval _____
Signature of Assistant Dean, Intellectual Foundations

3. **Action** of the College Senate Curriculum Committee

X Recommend approval and forward to College Senate

11/17/2009 — Nancy A. Chiola
Date — Signature of Chair, College Senate Curriculum Committee

_____ Recommend disapproval and return to Department

_____ _____
Date — Signature of Chair, College Senate Curriculum Committee

ACTION OF THE OFFICE OF ACADEMIC AFFAIRS

X Approved and forwarded to President _____ 11/18/09
Signature — Date

_____ Disapproved and returned to Department _____ _____
Signature — Date

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.

Student Learning Outcomes: Students will	**Course Content References:**	**Assessment:**
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*, 4th 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,* 2nd ed., Wiley, 1987.

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

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

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

Wagner, H. M., *Principles of Operations Research: with Applications to Managerial Decisions*, 2nd 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/.

ScienceDirect, Elsevier B.V., "Operations Research Letters," www.sciencedirect.com/science/journal/01676377.